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STUDIES IN DIABETES MELLITUS AND TRANSIENT GLYCOSURIA IN SELECTEES AND VOLUNTEERS

HARRY BLOTNER, M.D., AND MAJOR ROBERT W. HYDE, M.C., A.U.S.
WITH THE ASSISTANCE OF SERGEANT LOWELL V. KINGSLEY, A.U.S.

BOSTON

A FEATURE of the medical examination of selectees and volunteers at the Boston Armed Forces Induction Station has been the frequency with which glycosuria was discovered. Since most studies in diabetes mellitus have been made on more or less select groups of people, few of them give a clear idea of the frequency and significance of mellituria in a cross section of the population. The incidence of the disease has been based on life-insurance examinations, mortality statistics and various surveys. Limitations of such results are obvious, and calculations from mortality figures are crude. Consequently, considerable variations in the frequency of this condition have been reported.

A most interesting large-scale survey of the occurrence of known diabetes mellitus in the general population was made under the direction of the United States Public Health Service[1] in 1935-1936. The results were based on a house-to-house canvass of some 800,000 families, which included 2,800,000 persons. It was estimated from this survey that there were 660,000 cases of diabetes mellitus in the United States. This figure, however, represented only known cases of diabetes, and no doubt there were many unrecognized ones in the population studied, as can be inferred from the number of unrecognized cases discovered in the present study. A report of the medical findings in the New York City Selective Service Administration showed the incidence of diabetes to be 416 cases (0.36 per cent) among 155,569 registrants in the City of New York.[2]

The majority of observations of the various phases of this disease have been made on cases of diabetes with symptoms in groups of people that are not representative of the male population. Consequently, not so much is known about the cases of diabetes that have been found on routine examinations. The opportunity presented itself to study at the Boston Induction Station various aspects of transient glycosuria and diabetes and their relation to socioeconomic factors in a large unselected group of men. In this group, an estimated 78 per cent of the cases of diabetes were discovered without the persons' ever having known that they had the disease. It seemed that an investigation of such cases of diabetes as well as those of known duration would be of considerable significance.

This paper presents a study of diabetes mellitus and transient glycosuria in 45,650 consecutive selectees and volunteers, aged eighteen to forty-five years, who appeared for final examination at the Boston Induction Station, prior to induction in the armed forces. The men appearing for final examination at this station form an excellent cross section of men of military age without dependents, not engaged in essential industry, and not possessing obvious disqualifying defects evident on inspection by local-board examiners.

PLAN OF INVESTIGATION

All men had thorough physical and mental examinations, routine chest roentgenograms and urine examinations.

The test for sugar in the urine was made with Benedict's qualitative solution. The qualitative amounts of sugar in the urine were indicated according to the color changes: + for green, ++ for yellow, +++ for orange and ++++ for brick red. When sugar was found, the urine was tested again before and after lunch on the same day. If the repeated urine examinations showed sugar and if there was not a verified history of diabetes, the men were sent to an Army hospital for sugar-tolerance tests. A standard dose of 100 gm. of dextrose was employed and was ingested after the subject had fasted overnight. The con-

centration of sugar in the blood and urine was determined in specimens taken during fasting and at intervals of one half, one, two and three hours after the ingestion of the dextrose. The determination of the blood sugar was made on 2-cc. samples of venous blood according to the method of Folin and Wu.[3]

Observations were made on certain clinical and social aspects of diabetes mellitus and transient glycosuria. The clinical aspects studied were incidence and diagnosis, age at onset and at present, height and weight, frequency of hypertension and of pulmonary tuberculosis, general physical status and family history of diabetes. The social investigations consisted of community studies on the relation of the prevalence of diabetes mellitus to socioeconomic level, community welfare rate, population density, occupation and nationality. All cases of diabetes were classified according to the type of community from which they came. The social study of these communities was made according to the plan of Hyde and Kingsley.[4] Their classification of community socioeconomic level was based on good, medium and poor community desirability. These findings were compared with those of a large control group of nondiabetic persons who were examined here.

Incidence and Diagnosis

The incidence of glycosuria, which in degree varied from + to ++++, was found to be 367 cases (0.8 per cent) of the 45,650 men examined. For the purpose of simplicity the cases of glycosuria were divided into three groups, as follows: 208 cases of diabetes mellitus, 126 cases of transient glycosuria, and 33 cases of renal glycosuria, which have been reported elsewhere.[5]

Diabetes mellitus was diagnosed when the subject had a blood-sugar concentration that reached a level of 180 mg. per 100 cc. and some or all of the urine specimens contained varying amounts of sugar after the ingestion of 100 gm. of glucose. Some of the fasting urine specimens were sugar free and some of the fasting blood sugars were normal. Of the 208 cases of diabetes mellitus, 107 were mild, 58 were moderate, and 43 were severe. Illustrations of these are given in Figure 1.

The cases of mild diabetes usually showed normal fasting blood-sugar levels. Some of the fasting urine specimens contained sugar, whereas others were sugar free. After the ingestion of the test dose of glucose, the blood sugar rose in one half or one hour to 200 or 220 mg. per 100 cc., and then dropped in two hours to 150 mg. and in three hours to 100 or 125 mg. The urine specimens contained varying amounts of sugar.

The moderate cases of diabetes showed a fasting blood-sugar level of 140 mg. per 100 cc., with or without sugar in the fasting urine specimens. After the ingestion of the glucose the blood sugar rose in one half or one hour to 275 mg., and then

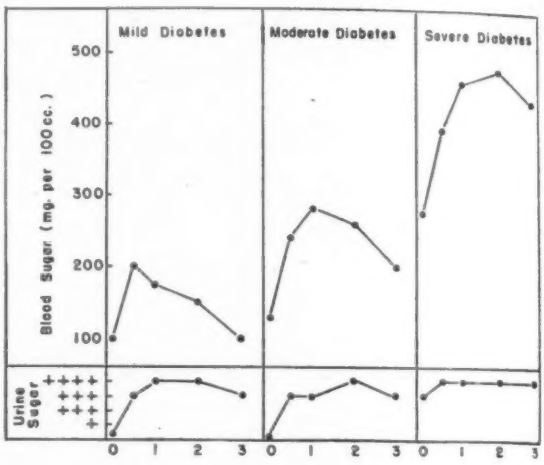

Figure 1. *Characteristic Results in Mild, Moderate and Severe Diabetes Mellitus at Hourly Periods after the Ingestion of 100 Gm. of Glucose.*

dropped to about 200 mg. in three hours. The urine specimens contained varying amounts of sugar.

The cases of severe diabetes showed a fasting blood-sugar level of 275 mg., with considerable amounts of sugar in the urine. After the ingestion of the glucose the blood-sugar level rose to about 475 mg. in one hour and dropped only slightly in three hours. All the urine specimens contained large amounts of sugar.

Transient glycosuria was diagnosed in the men who had varying amounts of sugar in the first specimen of urine tested, and showed negative reactions on subsequent tests during the day. If sugar-tolerance tests had been done in all these cases, it is quite probable that a number of cases of diabetes mellitus and renal glycosuria would have been discovered.

Clinical Features

Age. Diabetes mellitus may be recognized at any period from infancy to old age. Although the men examined here were over eighteen years of age, a number of them knew that they had had the disease since childhood.

The incidence of glycosuria at the various present ages and the age at onset are given in Table 1. It shows that the average age of the diabetic patients was 34.4 years, that of the men with transient glycosuria 30.9 years and that of the control group 27.5 years. Ordinarily one thinks of the

severe cases of diabetes as being in younger persons and the mild cases in older ones. In this study, however, the average age in the mild cases was 31.2 years, in the moderate cases 36.6 years and in the severe cases 34.4 years. Forty-two (22

TABLE 1. *Age Incidence of Diabetes Mellitus and Transient Glycosuria.*

AGE	PRESENT AGE OF 208 DIABETIC MEN	AGE AT ONSET OF DIABETES IN 189 DIABETIC MEN	PRESENT AGE OF 126 MEN WITH TRANSIENT GLYCOSURIA	PRESENT AGE OF 1000 NONDIABETIC MEN
yr.	%	%	%	%
2–7		1		
8–16		4		
18–25	19	20	39	43
26–30	13	15	11	17
31–35	15	17	14	11
36–40	20	15	16	15
41–45	33	28	19	14
Average ages	34.4 yr.	33.0 yr.	30.9 yr.	27.5 yr.

per cent) of 189 diabetic men had a known duration of the disease for one to twenty-three years, and the average age at onset of diabetes was 33 years, or 1.4 years lower than the average present age of all the diabetic men.

Diabetes is generally regarded as occurring with special frequency in the older groups, especially between the ages of fifty and sixty. Probably the incidence in the older age groups is not so great as previously thought because many people have undoubtedly had diabetes for some years without knowledge of it. As a result, a cumulative effect of age is obtained in later years of life. This effect was particularly brought out in a study of the present age and the age of onset of diabetes in 42 men who had had the disease for one to twenty-three years, as illustrated in Table 2. If

TABLE 2. *Present Age and Age at Onset of the Disease in 42 Diabetic Men with a Known Duration of One to Twenty-Three Years.*

AGE	PRESENT AGE	AGE AT ONSET
yr.	%	%
2–7		5
8–16		17
18–25	34	29
26–30	14	19
31–35	14	21
36–40	21	7
41–44	17	2
Average ages	31.8 yr.	24.2 yr.

one notes the age at onset of the disease in this group, there is a preponderance of diabetes in the younger men and fewer cases in the oldest age groups. Yet if one studies their present ages, a marked contrast is observed.

Weight. One of the chief constitutional features in the onset of diabetes has been considered to be overweight. Consequently a study of the weight was made in 196 cases of diabetes mellitus and 103 cases of transient glycosuria. These results are given in Table 3. In the diabetic men, the weights were studied according to the mild, moderate and severe cases, and since the results were approximately the same in the various types of cases, the weights are reported for diabetes in general. The average diabetic man weighed 158 pounds and was 34.4 years old, whereas the average man with transient glycosuria weighed 151 pounds and was 30.9 years old. The averages of 1000 consecutive selectees were 140 pounds and 27.5 years. Weights ranging from 12 pounds above to 12 pounds below the Army standard[6] for height and age were called normal. When a

TABLE 3. *Weight in Diabetic Men, Men with Transient Glycosuria and Nondiabetic Men.*

WEIGHT ACCORDING TO HEIGHT AND AGE (ARMY STANDARD)	196 DIABETIC MEN	42 DIABETIC MEN WITH DISEASE OF 1 TO 23 YEARS' DURATION	103 MEN WITH TRANSIENT GLYCOSURIA	1000 NON-DIABETIC MEN
	%	%	%	%
Underweight:				
30–40 lb.	3	0	0	2
14–28 lb.	11	14	22	10
Normal weight	48	57	53	56
Overweight:				
15–34 lb.	16	19	12	20
35–54 lb.	9	5	5	8
55–79 lb.	8	0	7	3
80–134 lb.	5	5	1	1
Average weights	158 lb.	151 lb.	151 lb.	140 lb.

correction of 5 pounds is made for the greater age of seven years in the diabetic group, the excess weight over the control group is 13 pounds. After an adjustment of nine pounds is made for the greater height and age of the men with transient glycosuria, their excess weight is only 2 pounds. It is the few markedly obese diabetic men who increased so much the average weight of all the diabetic men.

Approximately 62 per cent of all the diabetic men, 75 per cent of those with transient glycosuria, and 68 per cent of the nondiabetic men were of either normal or subnormal weight. On the other hand, 38 per cent of the diabetic men, 25 per cent of those with transient glycosuria and 32 per cent of the nondiabetic men were 15 to 134 pounds above the standard. The weights of the men who had had diabetes for one to twenty-three years were not significantly different from those of the control group.

Height. The heights of the men with diabetes mellitus and transient glycosuria ranged from 60 to 74 inches, as shown in Table 4. The average height of the diabetic men was 66.0 inches and of those with transient glycosuria 67.8 inches. (In Joslin's male adult diabetic patients,[7] the aver-

age height was 67.2 inches.) These compare with the control height of 66.4 inches based on the measurement of 1000 consecutive selectees. The diabetic men appeared of average normal height,

TABLE 4. *Heights in Diabetic Men, Men with Transient Glycosuria and Nondiabetic Men.*

HEIGHT	205 DIABETIC MEN	42 DIABETIC MEN WITH DISEASE OF 1 TO 23 YEARS' DURATION	122 MEN WITH TRANSIENT GLYCOSURIA	1000 NON-DIABETIC MEN
in.	%	%	%	%
60–63	19	16	10	10
64–66	34	26	33	33
67–68	27	31	24	26
69–71	19	23	28	26
72–74	1	4	5	5
Average heights	66.0 in.	66.7 in.	67.8 in.	66.4 in.

whereas those with transient glycosuria were 1.4 inches above the normal, a fact that appears significant. Most of the men with glycosuria were between 64 and 68 inches tall.

Blood pressure. The blood pressures were studied in all cases. Hypertension that was comparatively mild (over 150 systolic, 90 diastolic) occurred in 7 per cent of the diabetic men and in 5 per cent of those with transient glycosuria. The diastolic pressures ranged from 80 to 124, and the systolic from 160 to 194. The incidences of hypertension in the severe diabetic cases and those of transient glycosuria were somewhat less than those in the mild and moderate diabetic cases, as shown in Table 5. In the 42 men with diabetes

TABLE 5. *Incidence of Hypertension in Various Groups of Diabetic Men, Men with Transient Glycosuria and Nondiabetic Men.*

	207 DIABETIC MEN			126 MEN WITH TRANSIENT GLYCOSURIA	1000 NON-DIABETIC MEN
	107 MILD CASES	58 MODERATE CASES	42 SEVERE CASES		
Incidence of hypertension	7.5%	7.0%	5.0%	5.0%	2.2%

of one to twenty-three years' duration only 1 had an increased blood pressure (170 systolic, 110 diastolic).

Pulmonary tuberculosis. Pulmonary tuberculosis has been considered in the past as a significant complication of diabetes.[8] The opportunity seemed excellent to compare the routine x-ray findings of the chest in diabetic men and in those with transient glycosuria with those in nondiabetic persons. In 208 cases of diabetes not an active case of pulmonary tuberculosis was found, in contrast to the average incidence of pulmonary tuberculosis of 0.9 per cent found in a one-year study of selectees.[9] There was, however, one nodular or arrested case and 6 cases of healed primary tuberculosis, which is consistent with the average of 3 per cent primary tuberculosis found by x-ray in nondiabetic persons. In 126 cases with transient glycosuria there were 2 cases with minimal pulmonary tuberculosis and 1 with moderately advanced tuberculosis. Root[10] believes that the susceptibility of diabetics to pulmonary tuberculosis depends largely on the control of the diabetes. However, in our group, which consisted chiefly of men with uncontrolled diabetes, there appeared to be the same amount of pulmonary tuberculosis in the persons with glycosuria as in all other volunteers and selectees examined.

Physical condition. In general the physical condition of all the diabetic men and of those with transient glycosuria did not differ from the control group except for the increase in the incidence of hypertension and the slight increase in the average weight of the diabetic men. No other endocrine disturbances were noted. On the whole it is fair to say that the diabetes had no effect on the physical state of the 42 persons aged eighteen to forty-five who had had this disease for one to twenty-three years. As a matter of fact, they were essentially free of vascular disease and, as previously mentioned, only 1 had an elevated blood pressure.

Treatment. The diabetic men discovered on routine examination had had no particular previous treatment. Of the 42 men who knew that they had had diabetes mellitus for one to twenty-three years, 11 cases were moderate, 6 were mild, and 25 were severe. Therapy in 9 of the 17 mild and moderate cases consisted of diet only, whereas 4 received small doses of insulin, 3 followed no treatment and no record of treatment was made in 1 case. Of the 25 severe cases, 19 took some form of insulin. Twelve injected daily 26 to 100 units of protamine insulin, and 5 of these received in addition 12 to 40 units of regular insulin a day. Seven patients took regular insulin only in daily amounts of 30 to 83 units a day divided into one to three doses. Three followed a diet only and 1 followed no specific treatment. No record of treatment was made in 2 cases.

Family history of diabetes. The inheritance of diabetes has been pointed out by many writers. The family history of diabetes was studied in 126 cases of diabetes mellitus and in 77 cases of transient glycosuria. The familial incidence of diabetes in mild, moderate and severe diabetic cases was much the same. Of 126 diabetic persons interviewed, 41 (32 per cent) gave a family history of this disease, which had occurred in one to seven members of the family. There was a family

history of diabetes in 36 per cent of the diabetic men who had had the disease for one to twenty-three years, and in 30 per cent of those cases that were discovered on routine examination. Of the 77 men with transient glycosuria, 7 (9 per cent) gave a family history of diabetes, which had appeared in only one or two members of each family. In a control study, 2293 consecutive nondiabetic selectees were interviewed and only 119 persons (5.2 per cent) gave a family history of diabetes; this occurred in all cases in only one member of the family. An analysis of the diabetic relatives is given in Table 6.

The diabetic relatives of the 41 diabetic men with a family history of diabetes amounted to 68. Of these, 29 had a history of the disease in only one member of the family. In 12 diabetic cases the disease had existed in two to seven members of each family, with a total of 39 diabetic relatives,

TABLE 6. *Diabetic Relatives of Diabetic Men, Men with Transient Glycosuria and Nondiabetic Men.*

RELATION	41 DIABETIC MEN	7 MEN WITH TRANSIENT GLYCOSURIA	119 NONDIABETIC MEN
Grandparent	1	0	20
Mother	13	3	47
Father	13	3	46
Brother	12	1	2
Sister	12	0	1
Aunt	7	1	1
Uncle	8	1	1
Cousin	2	0	1
Totals	68	9	119

as follows: 6 with two relatives each, 2 with three relatives each, 2 with four relatives each, 1 with six relatives, and 1 with 7 relatives. Of the 7 men with transient glycosuria, 5 gave a history of diabetes in one member of the family and 2 in two members of the family.

COMMUNITY STUDIES

Community desirability. The classification of the community desirability was based on the seven factors of medical care, educational and recreational facilities, crowded housing, social class, public works and welfare rate. The good communities, largely well-to-do residential areas, were superior in all these aspects; the poor communities, with low ratings in these factors, were poor, crowded tenement areas; and the medium classification included all the intermediate socioeconomic gradations of the middle class. The incidence of diabetes in relation to community desirability is shown in Table 7.

This study shows no significant variation in the prevalence of diabetes mellitus in selectees from communities of different socioeconomic levels. This lack of relation to socioeconomic background is quite unexpected in view of the stress that has been placed on the influence of inactivity and increased diet among the upper classes, but is what

TABLE 7. *Prevalence of Diabetes Mellitus According to Socioeconomic Level of the Community.*

TYPE OF COMMUNITY	NO. OF MEN EXAMINED	MEN WITH DIABETES MELLITUS
		%
Good	5,221	0.71
Medium	17,059	0.73
Poor	7,869	0.75

might well be expected in a disease of such hereditary nature.

Communities were also classified by welfare level, on the basis of the amount of welfare paid per capita, as given by Lambie.[11] The relation of diabetes mellitus to the welfare rate of the community from which the selectees come is shown in Table 8. This relation shows that there is little variation in its incidence at different community welfare levels. In contrast, the total rejection rate for all causes increased in the poorer communities and in those with higher welfare rates, as might be expected from poorer living conditions and medical care, which are so often concomitants of increased welfare.

Previous work on diabetes[12] has suggested that this finding would be different — that is, a decrease in diabetes in the communities with the highest welfare rates, because of greater privation, and an increase in diabetes in the upper classes because of excess food intake and sedentary occu-

TABLE 8. *Prevalence of Diabetes Mellitus According to Community Welfare Rate.*

ANNUAL PER CAPITA WELFARE RATE	NO. OF MEN EXAMINED	MEN WITH DIABETES MELLITUS
		%
Less than $20	4759	0.7
$20–29	4919	0.5
$30–39	8909	0.6
$40 and over	3724	0.8

pations. This, however, is not shown, since the communities with the highest welfare had 0.8 per cent of diabetes mellitus and the lowest bracket had 0.7 per cent.

Population density. Communities were grouped according to population per square mile, and their incidences of diabetes are shown in Table 9. The higher prevalence of diabetes in the communities with higher population density can hardly be explained by chance.

An increase of diabetes in urban areas has been recognized by Joslin,[13] who explains it in several

ways: more sedentary living, a higher economic level with more abundant eating and a larger element of Jews in the population, with their high prevalence of diabetes. Previous findings indicating the failure of the community socioeconomic

TABLE 9. *Prevalence of Diabetes Mellitus According to Population Density.*

Population per Square Mile	No. of Men Examined	Men with Diabetes
		%
Under 1000	3928	0.4
1000–4999	7613	0.5
5000–9999	6778	0.8
10,000–19,999	7179	1.0
20,000 or over	5479	0.8

level to influence diabetic prevalence and the lack of relation to laborious occupations suggest that these factors cannot be considered in the interpretation of the increased prevalence of diabetes in increased population densities. The factor of nationality appears to be, in part at least, a satisfactory explanation for the high prevalence of diabetes in dense urban areas, for both Jews and Irish are concentrated in the urban high-density areas in sufficient number to elevate the prevalence to about 0.8 per cent for those areas from 0.4 per cent in the least populated regions. There may be other, as yet undetermined, factors relating to population density, but it will take much further investigation to demonstrate them.

Occupation. Occupation has been considered to be an important predisposing factor of diabetes mellitus, which has been thought to occur with much greater frequency in persons with sedentary occupations than in those with laborious occupations. Types of occupations were studied in 118 diabetic men and in 81 with transient glycosuria and compared with the occupations of 1400 consecutive selectees and volunteers.

Occupations were divided into three types, as follows: "white collar," light labor and heavy labor. The white-collar group included clerks, students and business and professional men. The light-labor group included factory and mill workers, taxi drivers, drivers of light delivery trucks, salesmen, pipe fitters, painters and electricians. The heavy-labor group included longshoremen, drivers of heavy trucks, shipyard welders, masons, plumbers, carpenters and farmers. The results are shown in Table 10.

It was most interesting to find that the percentages of diabetic men doing heavy labor, light labor and white-collar work were almost identical with those of the control group. The results with transient and renal glycosuria were also similar. These observations appear significant, and strongly suggest that occupation in general is not a predisposing factor in the etiology of diabetes.

Those communities in which there was one predominant occupation were classified and the prevalence of diabetes considered as shown in Table 11. A great variation existed with shoe-manufacturing towns and urban commuters' areas having the greatest amount of diabetes. This again suggests that diabetes is as common in those engaged in manual labor as in those in sedentary occupations, for both the workers in the shoe

TABLE 10. *Occupation Classified According to Glycosuria of Various Types.*

	White-Collar	Light Labor	Heavy Labor
	%	%	%
No glycosuria	24	63	13
Diabetes	24	64	12
Transient glycosuria	20	75	5
Renal glycosuria	27	68	5

towns and the urban commuters' areas were for the most part doing manual labor, although many were clerks and office workers. The low prevalence in farming and fishing communities is hard

TABLE 11. *Incidence of Diabetes in Communities with a Dominant Occupation.*

Occupation	Incidence of Diabetes
	%
Leather and shoe manufacturing	1.3
Urban commuters	1.2
Suburban commuters	0.9
Textile workers	0.6
Farming	0.5
Fishing	0.4

to understand. It is partially explained by the almost complete absence of both Jewish and Irish elements from the population of these areas, and Joslin's explanation that these groups are engaged in the hardest type of manual labor may pertain, although it does not coincide with our finding.

Nationality. The incidences of the nationalities of 128 persons with diabetes mellitus and 88 with transient glycosuria were compared with that of a control group of 7350 consecutive persons at this induction station. The results are shown in Table 12. The nationality was determined according to the birthplace of the parents of the men examined. For example, the nationality was called American when both parents were born in this country. If a selectee was born in this country and his parents in Ireland, his nationality was called Irish. The Jewish persons were ordinarily Russian, Polish or Austrian.

The findings of the nationalities appeared of considerable interest. Of the men examined, 45

per cent were Americans, but they constituted only 33 per cent of the diabetic group and only 21 per cent of those with transient glycosuria. On the other hand, the non-American group in general showed a greater incidence of diabetes and a much greater incidence of transient glycosuria than did the control group.

It appears that the longer are the generations of nationalities in this country, the more the incidence of diabetes diminishes, at least to a certain point, because of the low incidence in those classed as Americans, who are of course originally of foreign extraction. The Jews and Irish were of particular interest. The Jews had more than twice as many in the diabetic group as in the control group. The Irish, who constituted 11 per cent of the control group, showed a marked increase to 18 per cent of the diabetic cases and 21 per cent of those with transient glycosuria. The marked increase in the per cent of transient glycosuria in the Irish may possibly be explained on the basis of chronic alcoholism, because Hyde,[14] as well as Haggard and Jellinek,[15] found a high incidence of chronic alcoholism in the Irish. The French, with only 0.1 per cent of the control group, made up 4.7 per cent and 7.4 per cent of the groups with diabetes and transient glycosurias, respectively. The French and Canadian groups may not be reliable because some of the French were probably from Canada. If the French and Canadians are considered as a whole, the incidence of these conditions is practically the same as the control group. The group of other nationalities showed a marked increase in the percentage of transient glycosuria.

Table 12. *Incidence of Diabetes and Transient Glycosuria According to Nationality.*

Nationality	Control Group	Diabetic Group	Group with Transient Glycosuria
	%	%	%
American	45	33	21
Irish	11	18	21
Italian	10	7	11
Jewish	6	13	9
Portuguese	5	5	1
Canadian	9	5	3
Other nationalities*	14	19	34

*French, Greek, English, Polish, Scottish, Negro, German, Lithuanian, Armenian and Syrian.

Those communities wherein a major element of the population was of one nationality by extraction were considered by nationality, as shown in Table 13. This presents a different aspect of nationality than that presented by a consideration of nationality alone, for a minority of other nationalities exists in the community, and persons in a foreign community present more habits and customs of the nationality than do those who have gone into mixed communities. It has special value as presented here, not only because it confirms the study of nationality but also because it shows to just what extent nationality can affect a community, and hence helps to explain the correlation of the incidence of diabetes with population density or other social considerations.

Table 13. *Prevalence of Diabetes According to Predominant Community Nationality.*

Nationality	No. of Men Examined	Men with Diabetes
		%
Jewish	1014	1.8
Irish	835	1.3
Canadian	302	0.66
Italian	1791	0.50
Portuguese	1706	0.35

Summary

This paper presents certain clinical and socioeconomic studies on diabetes mellitus and transient glycosuria that occurred in 45,650 consecutive selectees and volunteers, aged eighteen to forty-five years, who appeared for final examination at the Boston Armed Forces Induction Station.

The incidence of glycosuria was found to be 367 cases, or 0.8 per cent of the men examined. The cases of glycosuria were divided into three groups with the number of cases as follows: 208 cases of diabetes mellitus; 126 cases of transient glycosuria and 33 cases of renal glycosuria. Of the 208 cases of diabetes, 107 were mild, 58 were moderate and 43 were severe.

The average present age of the diabetic men was 34.4 years and that of the men with transient glycosuria 30.9 years, as compared with the average age of 27.5 years of the nondiabetic group. The average age at onset of all the diabetic men was 1.4 years lower than their present age. The average present age of those with diabetes of one to twenty-three years' duration was 31.8 years, compared with the average age of 24.2 years at onset, showing how a cumulative effect of age is produced as the diabetic men grow older.

The average weight of patients with diabetes and transient glycosuria was slightly higher than that of the control group. However, 62 per cent of the diabetic men and 75 per cent of those with transient glycosuria, as compared with 68 per cent of the nondiabetic men, were of either normal or subnormal weight according to Army standards. Except in a few cases, obesity did not appear to be an important factor in these cases. The average height of the diabetic men was the same as that of the control group.

The physical condition of the men with glycosuria did not differ from that of the nondiabetic

men, except that mild hypertension appeared in 7.0 per cent of the diabetic men and in 5.0 per cent of those with transient glycosuria, compared with 2.2 per cent in the control group. Pulmonary tuberculosis as determined from chest roentgenograms appeared with essentially the same frequency in the persons with glycosuria as in all the volunteers and selectees examined.

The inheritance of diabetes was of interest because family histories of diabetes were obtained in 32 per cent of the diabetic cases and in 9 per cent of those of transient glycosuria, as compared with 5.2 per cent of 2293 consecutive nondiabetic selectees. The number of diabetic relatives per family of each diabetic man was appreciably greater than that of the nondiabetic men.

Occupation did not appear to be a predisposing factor in the etiology of glycosuria, since the percentages of the men with glycosuria doing hard labor, light labor and white-collar work were almost the same as that in the control group.

Community studies of diabetes showed that the prevalence of diabetes was the same in communities of good, medium and poor socioeconomic levels. The relation of the prevalence of diabetes to community welfare rates showed little variation at the different community levels. In contrast, previous studies of diabetes have suggested that there is a decreased incidence in communities with the highest welfare rate, owing to privation. There was a higher prevalence of diabetes in communities with a high population density. Nationality seems to be, in part at least, an explanation for this phenomenon.

The nationalities, as based on the birthplace of the parents of the selectees, were studied. The incidence of diabetes and transient glycosuria was lower in the American group and higher in the non-American group, as compared with the incidence of the nationalities in the control group. The incidences of diabetes in the Jews and the Irish were outstanding.

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CURRENT CONSIDERATIONS OF THE ARMY ANESTHESIOLOGIST*

MAJOR STEVENS J. MARTIN, M.C., A.U.S.†

FORT DIX, NEW JERSEY

MILITARY campaigns necessitate medical preparedness. The expanded Army today is serviced by an enlarged and one of the most competent medical departments ever organized. All pertinent specialties are represented, and key personnel are virtually hand-picked. Notwithstanding a roster of 35,394 medical officers on active duty,[1] the proportion of officer anesthetists to other medical specialists is still surprisingly low. The need for such personnel has arisen not only from the greater number of hospital installations but particularly from the growing appreciation of the services such officers can render. To many, this demand, as well as the recognition of anesthesiology by the Army, has presented a challenge met only by requests for active duty in the armed forces. Thus far, two hundred and seventy-eight members of the American Society of Anesthetists, thirty-nine of whom are diplomates of the Board of Anesthesiology, are serving in the Army as anesthetists.[2] The total number is still short of the quota desired, and thus it may be expected that many more of our civilian confreres will join our ranks. To facilitate their early orientation with respect to military anesthesia as well as to elucidate a few of their professional duties to civilian surgeons, internists and general practitioners, some of the current considerations of the Army anesthesiologist will be presented. These may be logically grouped as those of basic and those of specific nature.

BASIC CONSIDERATIONS

Scope of Anesthesia

The present-day military anesthetist is no longer the glorified medical technician of World War I, nor is he a superman of the present conflict. He is simply one link in the chain of command of a surgical installation. However, his sound training in the fundamental principles of physiology, pharmacology, anatomy and so forth and his thorough appreciation of their clinical application have made him indispensable to surgeons. His anesthetic duties are clear cut and not unlike those of his civilian colleagues. According to the present scope of anesthesia per se (Table 1), his primary obligations to his patient and surgeons concern adequate preoperative preparation; relief of pain; muscular relaxation, prophylaxis and therapy for adverse cardiorespiratory derangements during surgery; and prompt and effective postoperative care to prevent or minimize complications of circulation or respiration. In addition, he may be of some aid to the internist with the use of diagnostic or therapeutic blocks in treating peripheral vascular disease, the intractable pain of cancer, angina pectoris or status asthmaticus, or with the help of resuscitative measures in combating gas or drug poisonings. These duties constitute the minimal requirements of a competent anesthetist, military or civilian.

TABLE 1. *Present-Day Scope of Anesthesia.*

SURGERY	MEDICINE
Preoperative	Diagnostic
Diagnosis	Peripheral vascular disease
Premedication	Hypertension
Operative	Therapeutic
Analgesia	Asthma
Relaxation	Angina
Prophylaxis	Intractable pain (cancer)
Therapy	Resuscitation (gas and drug poisoning)
Postoperative	Sciatica
Complications	
Therapy	

Orientation of Anesthetist

Notwithstanding their successful professional background, civilian anesthetists entering military service go through a period of orientation. Quite apart from adapting themselves to Army regulations, they become impressed early with the fact that favorite agents and pet technics are not always popular or possible to employ. Such a practice is not conducive to good anesthesia, even in civilian life, where anesthetic management of patients should also be individualized and not routine. Orientation to the use of many accepted anesthetic agents and technics is simple and rapid with competent anesthetists but difficult and uncertain with others. The Army supplies a variety of agents and equipment — a policy that meets not only the demands of the physical status of all patients but also the necessities of surgeons. Furthermore, such a plan may better facilitate the activities of an anesthetist in a mobile surgical hospital whose armamentarium and supplies are affected by combat situations. Accordingly, many anesthetists have had to relearn their technics of open-drop ether and chloroform as well as the advantages and limitations of both. Others have had to review their procedures of spinal and intravenous

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†Chief of Section of Anesthesia and Operating Pavilion and Section of Resuscitation and Oxygen Therapy, Tilton General Hospital, Fort Dix, New Jersey.

anesthesia and human anatomy to perform block anesthesia more successfully. In this phase of orientation, refresher courses[3] have been helpful to many.

Organization of Section

Officer anesthetists, assigned to hospital units or surgical teams, after their orientation and basic military training are immediately confronted with the problem of organizing their section. The scope of this problem depends on the type, size and location of the unit as well as on its general functions. In named general and station hospitals, which also serve as training centers, the complement of the Section on Anesthesia and Operating Pavilion may be as large as twenty persons, consisting of two officers, four nurses and fourteen enlisted men. In small units, such as surgical teams, there may be only one officer anesthetist and an enlisted man trained by him. The anesthetist supervises the activity of his personnel, making them available for surgery on a twenty-four-hour basis. This includes not only anesthesia but also the preparation of the entire operating pavilion, the latter duty being totally foreign to the average civilian anesthetist. He requisitions biweekly expendable supplies, such as anesthetic agents, gauze, antiseptic solutions and ligatures, and is responsible for the care, repair and availability of all anesthetic equipment and surgical instruments. Finally, to promote the prime function of his section in scheduling and facilitating surgical procedures, he must incorporate in the local hospital regulations certain definite, clear-cut and fundamental policies referable to the interrelations of his section with the surgical service as well as with medical, dental and laboratory services. The regulations should include comment on the matter of scheduling operations and preparing and premedicating patients, transporting them to and from the operating pavilion and prescribing the first postoperative treatment. In this general plan of organization, attention must be given to Army regulations and to the many helpful suggestions of the commanding officer and chief of the surgical service.

Specific Considerations

General Functions of Section Chief

Once the period of organization has ended and the Section on Anesthesia and Operating Pavilion is performing satisfactorily, the anesthetist or section chief can assume additional duties. These have been emphasized elsewhere.[4] His activities, briefly, can be of an administrative, professional or miscellaneous nature. Those of professional character may include not only the scheduling of all surgical procedures and the administration and supervision of anesthesia, but also the sterilization and autoclaving of equipment and laundry of all wards of the hospital as well as of the operating pavilion, the administration of plasma and whole blood and, finally, the centralization and supervision of inhalation therapy. It can readily be seen that the responsibilities of the military anesthetist are admittedly great and far more diverse than those of his civilian colleagues.

Records

The tabulation and maintenance of records are prerequisites of successful administration. The section chief of anesthesia has his share of the paper work to take care of. Aside from records referable to property accountability and requisition of expendable items, there are those pertaining to surgical procedures, anesthesia, pathology specimens and so forth. A composite record in book form of all surgical and anesthetic procedures may be authorized by the chief of the surgical service for future reference or compilation. Standard Form 55-0-1 is necessary for all operative patients, and includes data of the preoperative status of the patient and his progress during anesthesia. These may be of inestimable value to a patient being considered for limited duty, discharge or retirement. Wangeman[5] has suggested the use of a modified Hollerith punch card to compile surgical and anesthetic data in the Army for statistical studies.

Instruction of Personnel

One of the most important duties of the chief of Section on Anesthesia and Operating Pavilion concerns the instruction of his personnel. This applies to his officers, nurses and enlisted men. It is vitally necessary to ensure optimum efficiency of the section at all times, particularly in view of the fact that initially many of the personnel are inadequately trained for the functions they are to perform or, when trained, may be replaced by newcomers, owing to illness, combat injury or reassignment as a nucleus for new hospital units. Instruction is essentially of two types: training of surgical technicians and training of anesthetists. With the help and supervision of an experienced, responsible and competent chief operating-room nurse, enlisted men of the medical detachment can be instructed satisfactorily within three months in the duties of scrub or circulating nurses and sterilizing-and-autoclave-room attendants. It has been particularly gratifying to see the proficiency attained and enthusiasm shown in these duties by enlisted men who have had no more than high school or general college training.

Training in anesthesia has been conducted by the chief anesthetist in almost every hospital unit owing to shortage of such personnel. The type and duration of the course have varied at different posts depending on the instructor, his teaching ability and the background of his students. Through the kind suggestions and wholehearted co-operation of Colonel S. Jay Turnbull, the first organized course in anesthesia in the history of the Army, consisting of a series of lectures, demonstrations and practical supervision in the operating room, was given at Tilton General Hospital in July, 1941.[6] A year later the School of Anesthesia was officially authorized by the War Department, and several courses have since been given. Such training was designed to meet military needs. It was intensive and all-inclusive for the officers, but concerned only open-drop technic for the enlisted men. To conserve nurse personnel, and particularly to take advantage of the extensive laboratory background of many of the enlisted men, who could also be assigned to arduous duties in the operating pavilion when not administering anesthesia, enlisted men were preferred to nurses as students.

For medical officers, emphasis was given to inhalation, spinal, intravenous and block anesthesia with respect to the agents and equipment supplied by the Army. Fundamental principles and their clinical application were studied with agents such as ether, ethyl chloride, chloroform, nitrous oxide, procaine, Metycaine, and Pentothal Sodium, administered by technics suitable for mobile or fixed hospitals. Other agents, such as Vinethene, cyclopropane and nupercaine, and procedures such as continuous spinal or caudal anesthesia were demonstrated to indicate their particular usefulness for definitive surgery at fixed general hospitals. In addition, special attention was given to instruction in endotracheal technics, methods of resuscitation, inhalation technics and fluid or shock therapy. No effort was spared in the intimate supervision of practical training and of adaptation to military necessities.

Anesthetic Management at Various Medical Echelons

Considerations of anesthetic management constitute some of the most practical and significant problems the military anesthetist has to contend with. They are of prime importance to him, for therein lies his usefulness to his unit. To appreciate their magnitude fully, in contrast to the relatively complacent routine of the civilian anesthesiologist, some pertinent factors concerned will be mentioned.

Type of injury. Injuries may be those of the thorax, abdomen, extremities, central nervous system or maxillofacial region, or any combination of these. They require different technics and agents, and the choice of these by the anesthetist may play a significant part in the surgeon's program.

Severity of injury. Injuries should be classified and separated according to their major or minor character to expedite prompt and effective treatment of the more serious casualties.

Accompanying condition of patient. Major surgery may often be handicapped by delays in diagnosing and providing early treatment for patients showing asphyxia, variable degrees of peripheral vascular collapse, physical exhaustion, inanition, and exposure to extremes of temperature, sandstorms or snowstorms or tropical diseases.

Time interval between injury, diagnosis and treatment. This factor is admittedly of more importance to the surgeon than to the anesthetist, although its appreciation by the latter will favor a satisfactory anesthetic management.

Number of cases. Medical units, as in World War I, will either be in a state of readiness or be deluged with mass casualties. This latter situation will profoundly affect the anesthetic management in that individual considerations will be outweighed by those of the entire group.

Weapons or methods used in producing casualties. Patients exposed to gas attacks or suffering from blood loss may require resuscitation or shock therapy. Others showing tissue trauma will need surgery. A knowledge of the weapon causing the injury will aid the anesthetist in his plan of action.

Medical service available. Of all factors enumerated, the availability of medical service in the Army is of the greatest interest to the patient, the surgeon and the anesthetist. This problem has been fully appreciated, and after years of experience, intensive study and competent organization, the Medical Corps has developed the highest degree of efficiency in its history. Its functions of first aid on the battlefield, emergency treatment, evacuation and hospitalization of patients for definitive treatment are now being effectively carried out notwithstanding the complexities and difficulties of fluid and far-flung fronts. To the anesthetist, among others, it is imperative to understand the general plan of organization, the anesthetic armamentarium available at the various medical echelons and the probable anesthetic management at these locations.

The medical service of the Army is divided into five echelons, the first three of which are mobile and attached to tactical troops, and the last two of which are stationary or relatively fixed[7] (Table 2). The unit medical services, located some three

TABLE 2. *Outline of Medical Services of the Army.*

MOBILE:
Unit — battalion aid stations
Divisional:
Collecting and clearing stations
Surgical hospitals (Army supported)
Army:
1st echelon — battalion aid stations (as above)
2nd echelon — collecting and cleaning stations (as above)
3rd echelon — surgical (as above) and evacuation hospitals
4th echelon — numbered general and station hospitals (as below)
5th echelon — named general and station hospitals (as below)
FIXED:
Theater of operations (territorial commands):
Numbered general hospitals
Numbered station hospitals
Zone of interior (Surgeon General):
Named general hospitals
Named station hospitals

hundred to eight hundred yards behind forward-moving infantry, receive wounded by litter and provide emergency treatment, given in addition to the first aid administered on the battlefield. The divisional medical services, some twelve hundred to thirty-five hundred yards back, continue emergency treatment and sort out patients to be retained or to be evacuated to the rear. Several miles back may be found installations of the Army medical service, where surgeons, anesthetists and other medical specialists may be found. All types of emergency surgery may hence be performed. Some of these installations, such as surgical teams, may be sent forward in divisional areas for duty to facilitate early and prompt treatment. Thus the surgeons and the anesthetists are brought to the patient. This procedure obviates the necessity of transporting the seriously wounded, who can ill afford added physical strain. Units of the theater of operations may be one hundred to five hundred miles from combat areas, and those in the zone of interior are located in this country. In both these echelons, medical specialists are available to perform elective or definitive surgery or both. In the named general hospitals, both the personnel and the equipment are not unlike those found in leading hospitals of this country.

All types of medical services are adequately equipped with an anesthetic armamentarium for the duties that they are expected to carry out. No suffering need be experienced, for relief of pain may be provided anywhere from the battlefield to home stations. Table 3 briefly summarizes the type of anesthetic agents and equipment that may be found at the various medical services. Whereas medical officers are assigned to all five echelons, the anesthesiologist is first found in installations of the Army medical service along with surgical

TABLE 3. *Anesthetic Armamentarium in the Medical Services of the Army.*

MEDICAL SERVICES	ASSIGNED ANESTHETIST	ANESTHETIC ARMAMENTARIUM	
		AGENTS	EQUIPMENT
Unit	No	Ether Ethyl chloride Morphine sulfate Atropine sulfate Procaine Ephedrine Barbiturates	Yankauer mask
Divisional	No	Same, except for Army-supported surgical hospitals (see below)	
Army	Yes	Same as above plus: Nitrous oxide Oxygen in tanks Chloroform Pentothal sodium Metycaine	Same as above plus: Pharyngeal airways Laryngoscopes Endotracheal tubes Apparatus for closed-system anesthesia Modified suction apparatus Oxygen masks Needles and syringes for spinal and block anesthesia
Theater of operations	Yes	Same as above plus: Cyclopropane in some theaters	Same as above plus: Other equipment depending on theater
Zone of interior	Yes	Same as above plus: Avertin Certain nonstandard items, such as Vinethene, Nupercaine, Pontocaine and so forth	Same as above plus: Suction apparatus Iron lung Oxygen masks and tents Nonstandard items such as continuous spinal-anesthesia equipment and so forth

specialists. No equipment is lacking to provide the patient with safe, modern anesthesia.

Owing to dynamic elements of combat, it is not possible to carry out in forward areas the anesthetic program that may be desired any more than it is possible to do ideal surgery in the battlefield. Safe and adequate anesthetic management, however, can be provided for the surgery that can and must be done. In Table 4, it can be noted that relief of pain and muscular relaxation or both can be accomplished even in the unit medical services for emergency surgical procedures, such as débridement, control of active external bleeding, application of painful splints and bandages, and the severing of a mangled limb. For major and more specialized surgery, done from the Army medical service to the rear, a

choice of agents and technics may be had depending on the patient, the surgeon and the surgery contemplated. Anything from simple premedication and local infiltration to closed-system endotracheal anesthesia may be performed. Anesthetic management may thus be individualized and not routine. The same principles concerning contraindications of agents and technics, practiced by the civilian anesthetist will be adhered to at Army installations. The Army casualty will thus receive as good anesthetic management as does the civilian patient, if not better.

TABLE 4. *Anesthetic Management in the Medical Services.*

Medical Service	Type of Surgery	Anesthetic Management
Unit	Emergency	Emergency treatment: asphyxia, shock, relief of pain and anesthesia for minor surgery
		Local infiltration or open-drop technics
Divisional	Emergency	Essentially same on larger scale, except for Army-supported units (see below)
Army	Emergency (general and specialized)	Local infiltration or block anesthesia
		Inhalation anesthesia: open-drop, closed-system and endotracheal technics.
		Intravenous anesthesia
		Spinal anesthesia
Theater of operations	Elective and emergency	Same as above, except for advantages of better condition of patient and more complete anesthetic armamentarium
Zone of interior	Elective and definitive	Same as above plus nonstandard agents and equipment similar to those in leading hospitals of country

Discussion

The history of the military anesthetist in this country has closely paralleled the rapid development of anesthesiology. It can conveniently be divided into three distinct eras: prior to 1863, when anesthetists were practically unheard of in civilian and military hospitals; from 1863 to 1919, when the few anesthetic agents and technics known to anesthetists were employed in military installations[8]; and from 1919 to 1943, during which time anesthesiology became established and accepted as a medical specialty by the American Medical Association,[9] and during which the Army designated the Section on Anesthesia and Operating Pavilion in station and general hospitals[10] and authorized the status of an officer for an anesthetist in charge of such a section. The progress of the civilian anesthetist in the latter interval has been tremendous and far-reaching in its influence on military anesthesia. Aside from the introduction of new agents such as cyclopropane, Vinethene, Pentothal Sodium, avertin, Metycaine and Pontocaine and procedures such as the Waters[11] closed carbon-dioxide absorption system of anesthesia, endotracheal and endobronchial technics, intravenous anesthesia (Lundy[12]), regional anesthesia (Labat[13]) and continuous spinal[14] and caudal[15] anesthesia, there developed a keen and thorough appreciation of the fundamental physiologic, pharmacologic and anatomic principles underlying all anesthetic management. The present-day military anesthetist has kept abreast of the progress of his civilian confreres and is infinitely better prepared to function in his surgical unit than were his predecessors.

Notwithstanding the fact that the Army anesthesiologist is indispensable in military hospitals, there is still a shortage of such personnel on active duty. Some[3] have believed that there is an inadequate number of trained civilian anesthetists. Perhaps one of the reasons to account for the shortage of such trained men was the former lack of an organized training program for medical students, interns and residents. This, however, has been overcome by teaching outlines and laboratory and clinical investigations already published and available to all who are interested. It is more probable, however, that because anesthesiology per se is a relatively new medical specialty, some hospitals and medical schools have been reluctant to accept it as such. If true, this is a sad commentary on medical leadership, for anesthesia is a true American contribution to medicine. This situation seems to present a professional if not a patriotic challenge to those institutions still lacking modern organized departments of anesthesiology. With such departments in hospitals and medical institutions, competent anesthesiologists could be trained in large numbers for urgent military and civilian needs, and some of the current considerations of the Army anesthesiologist would be greatly minimized. His role in providing the safest and most modern anesthesia for military casualties would be even more significant than it now is.

Summary

The military anesthesiologist has contributed significantly to the prompt and efficient service of the medical department of the Army. Whereas his current considerations have been many and quite diverse from those of his civilian confreres, he has materially aided the function of his surgical unit. Some of his problems and functions have been briefly summarized.

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MEDICAL PROGRESS

THE GRAVE INFECTIONS OF THE HAND

MAJOR J. EDWARD FLYNN, M.C., A.U.S.*

BOSTON

LYMPHANGITIS, acute suppurative tenosynovitis and deep fascial-space abscess have been well named the grave infections of the hand. Any review of these conditions must be considered on an anatomic, clinical and therapeutic basis.

LYMPHANGITIS

Lymphangitis is an inflammatory process of the lymphatic vessels. Knowledge of these vessels dates from the time of Aristotle, but Herophilus and Erasistratus (*circa* 400 B.C.) deserve credit for discovering the chyliferous vessels. In 1622, Aselli discovered the lacteal vessels, and in 1651, Pecquet first described the receptaculum chyli and the thoracic duct. In 1651, Rudbeck discovered that the lymphatics of the intestines carried chyle to the liver. In 1664, Swammerdam discovered the valves of the lymphatics. In 1787, Mascagni published his atlas of the lymphatic vessels. About one hundred years later, in 1876, after twenty years of investigation, Sappey[1] published his exhaustive atlas. Sappey's anatomic descriptions form the basis of the modern concept of the lymphatic system. Little progress has been made in the knowledge of the anatomy of the lymphatics in the past sixty-seven years.

There are two types of lymphangitis, deep and superficial. Deep lymphangitis involves the deep lymphatic vessels, which are found in the deep tissues in association with the deep blood vessels. Superficial lymphangitis involves the superficial vessels, which arise in the skin. The collecting trunks of superficial lymphatics run in the subcuticular tissue. A knowledge of the anatomy of the lymphatics is basic for the proper understanding of the clinical aspects and treatment of lymphangitis.

The deep lymphatics follow the brachial artery and its chief branches, usually with two lymphatic trunks for each artery. The deep lymphatics of the upper extremity may be divided into radial, ulnar, anterior interosseous, posterior interosseous and humeral. The radial trunks drain lymph from the part supplied by the deep volar arch and the superficial palmar branch of the radial artery. They ascend the forearm as far as the bend of the elbow. The ulnar trunks drain lymph from the part supplied by the superficial volar arch and the deep and dorsal branch is the ulnar artery. The anterior interosseous and posterior interosseous lymphatics follow the arteries of the same names. The humeral trunks are two to three in number. They run by the side of the brachial artery and terminate in the humeral chain of axillary lymph nodes.

The superficial lymphatics of the fingers consist of volar and dorsal networks that converge into trunks at the side of the fingers. The digital trunks reach the base of the fingers in the interdigital space and traverse the dorsal aspect of the hand to the wrist. The network of superficial lymphatics of the palm drain into trunklets that divide into external, internal, inferior, superior and central vessels. In the wrist there are two groups, volar and dorsal. The superficial lymphatics diminish in number as they go up the arm. Sappey[1] states that they number about thirty in the forearm and from fifteen to eighteen in the middle of the arm. In the forearm, the volar vessels divide into three groups — external, internal and median. In this part the volar lymphatics are more numerous than the dorsal lymphatics. In the arm, the trunks unite into a single bundle on

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*Chief, General Surgical Section, Seventh General Hospital. Instructor in surgery, Tufts College Medical School, assistant to visiting surgeons, Boston City Hospital, and junior visiting surgeon, St. Elizabeth's Hospital (on leave of absence).

the external surface. The majority of collecting vessels terminate in the axilla in the humeral chain of axillary nodes. Two or three of the most internal end in the epitrochlear lymph node. The efferent vessels of this node perforate the deep fascia in the middle of the arm and end in the deep vessels. When this gland is absent, the internal collecting vessels may perforate the fascia at the same point to reach the deep absorbing vessels. The most external trunk separates itself from the other collecting vessels in the region of the humeral insertion of the deltoid and ascends in the deltopectoral groove, where it may traverse one or several nodes. This trunk usually passes into a subclavian node, placed at the spot where the cephalic joins the axillary vein. Mascagni[2] says that it may pass above the clavicle and empty into the supraclavicular node. Grossman states that this latter arrangement occurs in 38 per cent of cases.

Lymphangitis was recognized in the earliest stages of surgery. Kanavel,[3] however, reiterates the importance of differentiating lymphangitis from other grave infections of the hand, and stresses the need to distinguish deep from superficial lymphangitis. With deep lymphangitis there is usually a rapid increase of swelling of the whole hand and forearm, with some red lines running up the arm. Superficial lymphangitis usually lacks the rapid and great swelling of the entire hand and forearm. There is generally a history of abrasion of the hand. Red streaks are found extending up the arm. Kanavel emphasizes that with lymphangitis there is an absence of pain on hyperextending the finger and thumb, absence of tenderness over the tendon sheaths, voluntary movement of the fingers without pain, absence of bulging of the palm and absence of tenderness over the midpalmar and thenar spaces.

Until seven years ago, therapeutics in lymphangitis was based on the surgical principles of general rest, local rest, elevation of the part to facilitate lymphatic and venous drainage, local heat, proper diet, elimination and sedation. The specific treatment of lymphangitis dates from 1936, when Prontosil, synthesized by Mietzsch and Klarer,[4] proved by Domagk[5] to be effective against the hemolytic streptococcus in mice, was shown by Colebrook and Kenny[6] in their work on puerperal sepsis to be a potent chemotherapeutic agent in man.

Sulfanilamide, sulfapyridine, sulfathiazole and sulfadiazine have been used for lymphangitis. Many surgeons prefer sulfadiazine. When used in the proper dosage — 4 gm. initially, 1 gr. every four hours for the first twenty-four hours and 1 gr. every six hours until the temperature remains normal for twenty-four hours — a blood level of 7 to 10 mg. per 100 cc. is reached within six to eight hours, and is easily maintained. This blood concentration is adequate for bacteriostasis of the hemolytic streptococcus and *Staphylococcus aureus*, the organisms commonly found in lymphangitis. Clinically, sulfadiazine has the added advantage of being only slightly toxic.

Local measures designed to wall off and overcome the infection, together with procedures designed to support the system and increase its resisting power and to eliminate toxins, are necessary. In cases of lymphangitis, until localization is present, warm moist dressings should be used and hospitalization should be insisted on, with local and generalized rest, together with cathartics, maximum fluid intake and sedatives.

Warm moist boric acid dressings are used locally. Such applications owe their value to the hyperemia caused by the moist heat rather than to the drug, although there is some evidence that the latter's chemical action is of value. The arm is placed on a sterile towel, and sterile dressings wet with a warm saturated solution of boric acid are applied. The dressings are covered with rubber sheeting and the rubber sheeting is enveloped in towels. Two perforated rubber tubes are inserted in the gauze pack, through which warm boric solution may be introduced every two hours. The heat is maintained by the use of hot-water bottles. In severe cases the dressings are applied to cover the entire arm and shoulder. The dressings should always be larger than the area involved in the infection.

Hospitalization and local and systemic rest should be insisted on, especially in severe infections. Immobilization is necessary because every movement of muscles of the fingers, hand, forearm and arm favors lymphatic circulation and dissemination of infection. The hand and arm should be elevated on pillows to provide for proper lymphatic drainage.

Incisions for lymphangitis should never be made except in the presence of abscess formation. Such incisions open new lymphatics for infection and fail to reach bacteria that have already entered the lymphatic stream.

Seriously ill patients should be given much fluid and small amounts of easily digested food. Large amounts of water or fluid by mouth are necessary. Fluids are of great value in diluting and eliminating toxins. Occasionally, intravenous saline and intravenous glucose solutions and blood transfusions are indicated.

The complications of lymphangitis are subcuticular abscess, lymph-node abscess, subpectoral abscess, suppurative tenosynovitis, subclavicular and shoulder abscess, septicemia and pyemia, and chronic or repeated infections.

The subcuticular abscesses usually appear on the dorsum and should be incised. Since the advent of sulfonamide treatment delayed abscess formation has been noted, and the abscesses should be incised when present. Extensive subcutaneous destruction of connective tissue with the formation of slough and thin streptococcal pus is one of the most serious complications and should be treated by early incisions on the dorsum for adequate drainage. Abscesses of the lymph nodes occur, especially in the epitrochlear and axillary nodes, and are treated by incision and drainage. Subpectoral abscesses arise from infected nodes. Occasionally, a large quantity of pus fills the axilla and extends under the pectoral and subscapular muscles, and must be drained. Suppurative tenosynovitis is found especially in lymphatic infections beginning in the distal phalanges on the volar surface. Subclavicular and shoulder abscesses are rarely seen, and develop along the course of the lymphatics lying in the pectorodeltoid groove. Such infections most commonly have their origin in the middle finger. Chronic or repeated infections are found with certain types of streptococci, apparently owing to a failure to produce sufficient antibodies to overcome infection.

Acute Suppurative Tenosynovitis

Before Sappey's anatomical report, a study of deep abscesses of the hand was begun. Bauchet's[7] book on infections of the hand, published in 1859, was a masterpiece, but lacked a treatise on the lymphatic vessels. During the next twenty-five years, however, heated discussions ensued over lymphatic extension versus synovial-sheath extension of infection. Gosselin[8] after many anatomical dissections stated that extension almost always progresses along the synovial sheaths. Dolbeau,[9] by clinical observation, demonstrated that deep abscesses result from infection extending along the lymphatics. In 1875, Chevalet,[10] a pupil of Dolbeau, aided by the anatomical work of Sappey, substantiated his teacher's conclusions. Polaillon[11] and Le Dentu,[12] admitting that Dolbeau's contentions had some justification, supported Gosselin's theory.

Early anatomists described accurately the synovial sheaths of the flexor tendons of the index, middle and ring fingers. These sheaths begin at the bases of the distal phalanges and extend about a thumb's breadth proximally to the web.

Poirier and Cunéo[13] stated that in 19 of 20 cases the sheath of the flexor pollicis longus was continuous with the radial bursa. For clinical purposes it must be considered that in nearly all cases the sheath of the long flexor tendon of the thumb is continuous with the radial bursa. The tendon sheath of the flexor tendons of the little finger is continuous with the ulnar bursa in about half of all cases according to Poirier, but other authors disagree. I[14] have seen infection of the flexor tendon sheath of the little finger clinically limited to the finger in only 3 cases. Poirier stated that the radial and ulnar bursas had no communication with each other, and cited Gosselin, who had observed it only once. Kanavel[3] stated that clinically the communication between the two bursas is frequent. He found it in about half of his cases. Clinically, I,[14] have found a spread of infection from the radial to the ulnar bursa in 80 per cent of cases, and a spread from the ulnar to the radial bursa in 70 per cent. Kanavel described an intermediary posterior palmar sheath connecting the radial and ulnar bursas in 80 per cent of dissections, and an anterior intermediary palmar sheath connecting the radial and ulnar bursas was in 50 per cent. Tillaux[15] stated that the synovial sheaths of the ring, middle and index fingers on very rare occasions are continuous with the ulnar bursa.

In 1891, Tornier,[16] of the Greifswald Clinic, described the symptoms of tenosynovitis, reported clinical observations on a series of these cases, and emphasized the necessity of opening the sheaths widely, as suggested by Helferich.[17] In 1903, Forssell[18] reported a carefully observed group of cases that substantiated the observations of Tornier.

In 1912, Kanavel[3] stressed the four cardinal signs of suppurative tenosynovitis, as follows: tenderness over the involved tendon sheath, pain on hyperextending the finger, flexion deformity and swelling of the part involved. He also emphasized the need for differentiating acute suppurative tenosynovitis, lymphangitis and deep fascial space abscess.

Bacteriologically, streptococci were found most frequently, and *Staph. aureus* next most frequently. Mixed infections are especially prone to cause tendon slough. Gonococci as a cause of tenosynovitis have recently been said to be frequent in cases of acute suppurative tenosynovitis. In my experience, however, they are only occasionally the etiologic agent. Meningococci rarely cause suppurative tenosynovitis.

In all cases, a definite diagnosis of the clinical entity and anatomic extent must be made before operation is attempted. With suppurative tenosynovitis, the swelling, the flexion deformity of the finger involved and pain on hyperextending the finger are important. The localization and extent of tenderness are of the greatest value for diagnostic purposes.

A surgical team, with each member familiar with his assignment, is necessary. The operation should be performed under a general anesthetic, preferably nitrous oxide, oxygen and ether. A

bloodless field is obtained by constricting the arm with a blood-pressure cuff inflated to 250 mm. The arm is elevated for one minute as soon as the patient is relaxed, and the blood-pressure cuff is inflated while the arm is still elevated. The arm is then lowered, and a bloodless field can be maintained until the operation is completed. Only by good visualization can injuries to blood vessels and nerves be avoided, recognition of the site and extent of involvement be made, and adequate incisions with minimum injury be performed.

Surgically, Helferich,[17] over fifty years ago, showed the need for an adequate incision of the involved sheath. Incisions should drain every pocket of pus. Until about 1930, it was common to make interrupted incisions over the medial and lateral aspects of the proximal and middle phalanges. These incisions have been discarded because drainage was incomplete, secondary incisions were required in too many cases, and the incidence of tendon slough was too great. It was also common to make medial or lateral incisions from the base of the distal phalanx to the level of the proximal volar digital crease, anterior to the digital vessels and nerves. These incisions are condemned because they necessitate cutting across the volar digital crease, and this procedure endangers the vessels and nerves and may lead to herniation of the tendons.

Recently, Auchincloss[19] has suggested the use of a truncated-flap incision including all tissue down to the tendon sheath. In this incision, the distal end is cut along the flexion crease. The medial and lateral parts of the flap are cut obliquely downward, the digital vessels and nerves being avoided, and the incision is extended nearly to the next proximal crease. The incision has been made over the proximal and middle closed spaces. Rubber tissue and thread have been used for postoperative drainage. It affords excellent exposure of the sheath, but the subsequent sloughing of tendons is often great, and the exposure of the tendon may be too extensive. Also, a rolling backward and sloughing of some of the distal part of the flap sometimes occurs, which delays healing.

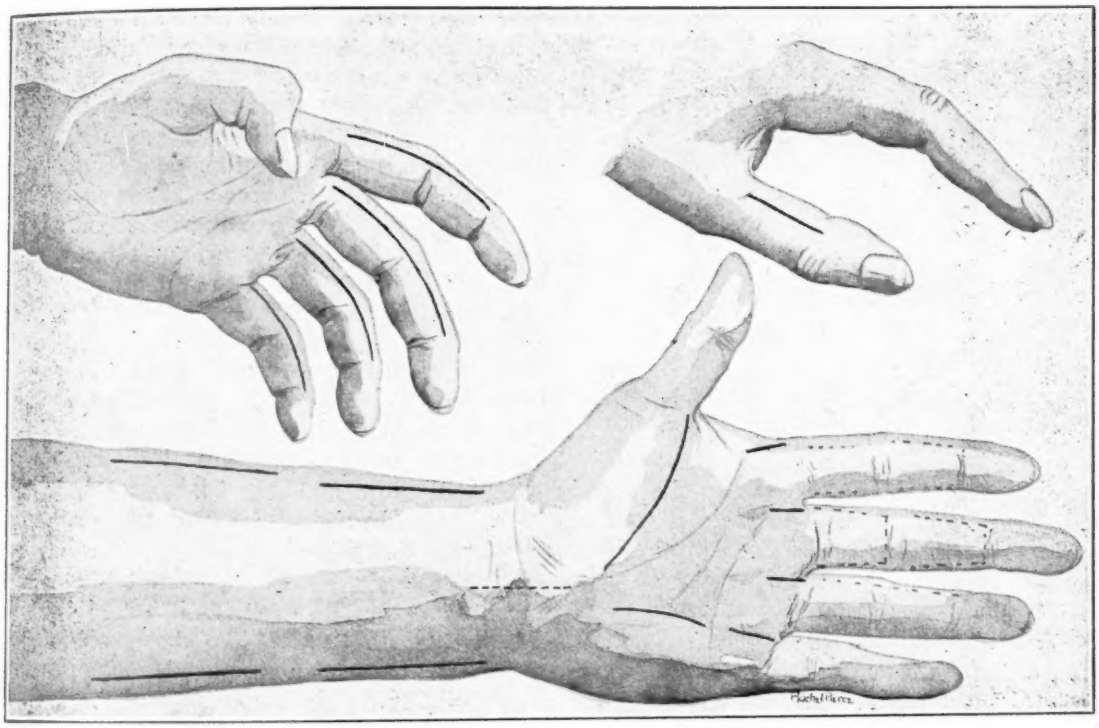

FIGURE 1. *Incisions for Draining Infected Tendon Sheaths, Radial and Ulnar Bursas, Spaces in Wrist and Forearm. (Reproduced by permission of* Surgery, Gynecology and Obstetrics.[14]*)*

The dotted lines represent rarely used incisions.

Some knowledge of the underlying anatomy is basic for correct surgical treatment. The proper digital arteries are slightly posterior to the digital nerves, and are found at the level of the anterior third of the medial and lateral aspects of the fingers.

Auchincloss has shown that the digital arteries give off branches that form an anastomotic

arch of blood vessels in the anterior subtendinous space. This arch gives off vessels to supply the bone, the synovial membrane of the joint and the tendon sheath, and the tendon itself. The tendon receives its branches through the mesotendon or so-called "ligamenta brevis."

In my experience,[14] the lateral incision has proved of the greatest value. It extends from the distal crease to the proximal volar crease (Fig. 1). The incision is posterior to the lateral extensions of the volar transverse creases and posterior to the digital vessels and nerves. The only objection to it is that it involves cutting the branch from the digital artery that makes up part of the anastomotic arch of blood vessels in the anterior subtendinous space, from which the mesotendon is supplied. This small cut branch, however, is not an end artery, and anastomotic circulation from the other side appears to be adequate to nourish the tendon sheath and tendon. In almost all cases of septic tenosynovitis of the flexor tendons of the index, middle and ring fingers it is necessary to drain the palmar portion of the tendon sheath. This is accomplished by a longitudinal incision from the base of the proximal digital crease, which is carried about 2 cm. proximally into the palm. The incision is begun on the same side of the digital crease as the digital incision.

In the surgical treatment of infections of the little finger tendon sheath and the palmar portion of the ulnar bursa I[14] use the following steps: A longitudinal incision is made over the lateral aspect of the little finger, posterior to the digital vessels and nerves and to the lateral extensions of the volar digital creases (Fig. 1). The palmar prolongation of the tendon sheath is drained by making an incision 2 cm. long from the center of the volar aspect of the proximal digital crease into the palm. The palmar portion of the ulnar bursa is drained by an incision extending from a point just proximal to the distal transverse crease in the palm to about the apex of the triangle in the base of the palm. The incision is made over the lateral edge of the hypothenar eminence. The digital branches of the ulnar nerve about 2 cm. proximal to the metacarpophalangeal joint, the anastomotic branch of the ulnar nerve to the median nerve and the ulnar artery about 1.5 cm. distal to the distal edge of the volar carpal ligament must be identified and medially retracted.

In the surgical treatment of infections of the thumb, a position of abduction of the thumb should be assumed to obviate anatomic distortion, particularly of nerves. I[14] use a longitudinal incision from the base of the distal phalanx to the base of the thumb on the ulnar side (Fig. 1). The palmar incision is a separate one that starts at about the middle of the proximal volar crease, just below the center of the volar aspect of the thumb. The incision is carried over the medial aspect of the thenar eminence, about two thirds of the distance to its base. The sensory and motor branches of the median nerve must be identified and retracted. At about the middle of the first metacarpal bone, a branch of the median nerve divides to send sensory branches to the medial and lateral aspects of the thumb. The important motor nerves to the opponens pollicis, abductor pollicis brevis and lateral portion of the flexor pollicis brevis, which rotate the thumb, arise from the median nerve, usually about 1.5 cm. proximal to the digital branches. The portion of the radial bursa proximal to where the nerves to the thenar muscles are found is not drained unless the volar carpal ligament is cut. The distal three fourths of the volar carpal ligament was cut in 2 cases in the series, not to expose the radial bursa, but to avoid injury to the median nerve and flexor tendons. Incisions through the entire volar carpal ligament, as suggested by some surgeons, should not be made because of exposure of the tendons and their prolapse.

Auchincloss[19] stressed the fact that accumulations of pus in the radial and ulnar bursas in the wrist may rupture into the space bounded posteriorly by the pronator quadratus muscle and anteriorly by the flexor digitorum profundus and flexor pollicis longus tendons. From the wrist pus spreads up the forearm into the space bounded anteriorly by the flexor digitorum sublimis and posteriorly by the flexor digitorum profundus and flexor pollicis longus.

Various anterior, medial and lateral incisions have been described, but any incision into these spaces must be made with due regard for the underlying vessels and nerves. If both the ulnar and radial bursas are involved, or if pus has ruptured into the pronator quadratus space in the wrist, an incision on the ulnar side of the wrist may be adequate. I[14] prefer an incision 6 cm. long over the anterior surface of the ulnar about 2 cm. above the styloid of the ulnar (Fig. 1). The approach is behind the flexor carpi ulnaris muscle and ulnar vessels. When the deep fascia is incised, the bulging ulnar bursa may be seen in the wound.

If the radial bursa alone is involved, an incision over the radial side of the wrist is made. A 6-cm. inch incision is made over the volar lateral aspect of the radius, as close to the bone as possible and posterior to the radial artery. When the deep fascia is incised, the bulging radial bursa may be seen in the wound.

Most infections from the wrist tend to spread up the ulnar side of the forearm, where most of the flexors are found. With infections of the intermuscular space of the forearm, a 6-cm. incision is made between the flexor carpi ulnaris and the ulnar margin of the flexor digitorum sublimis. The ulnar margin of the flexor digitorum sublimis is retracted laterally, and the space between it and the flexor digitorum profundus is entered by blunt dissection toward the latter. Great care should be taken not to injure the ulnar nerves and vessels that are adherent to the undersurface of the flexor digitorum sublimis.

An incision over the ulnar surface of the forearm, together with the wrist incisions, is usually adequate. With extensive accumulations of pus, however, an incision is made over the radial side of the forearm. The incision is about 6 cm. long at the middle third of the forearm and is made along the outer edge of the flexor carpi radialis. At this point, the lateral edge of the flexor digitorum sublimis muscle can be identified and retracted inward and the space entered by blunt dissection. The approach is internal to the radial artery.

Postoperatively, the infected hand is elevated on a pillow at all times to facilitate venous and lymphatic drainage. During the stage of acute infection, the hand and wrist are immobilized in an aluminum splint in the so-called "position of function." If treatment is prolonged, this position favors early and satisfactory use and provides fixation in a useful position if disability ensues. The fingers are semiflexed, the wrist is dorsiflexed, the hand is extended in the cocked-up position, and the thumb is abducted and rotated so that its flexor surface is opposite that of the index finger. With the fingers and hand in the position of function, even though tendons may be lost or ankylosis ensues, a fair degree of function results. It is strongly advised to permit no motion until infection is controlled. With a sloughed tendon, however, in the absence of osteomyelitis or septic arthritis, the joints may be manipulated to prevent adhesions and to permit future tendon grafting. Warm, moist dressings are applied under aseptic conditions. If the incisions are adequate, rubber-tissue drains may be omitted in twenty-four to forty-eight hours. Hospitalization until the infection subsides is of paramount importance.

Sulfonamides are administered, sulfadiazine being the drug of choice. Since the advent of sulfonamide treatment in purulent tenosynovitis there has been no great decrease in the incidence of tendon slough. This is apparently due to the time factor. With septic tenosynovitis existing for forty-eight to seventy-two hours, it is obvious that the sulfonamides cannot be a great factor in correcting physiologic changes that have occurred in blood vessels, pathologic changes in the involved tissues or mechanical changes in the tendon sheaths. Despite the fact that there has been no appreciable change in the incidence of sloughed tendons with sulfonamide therapy, there has been a decided decrease in the incidence of other severe complications in septic tenosynovitis.

Deep Fascial-Space Abscess

The fascial and aponeurotic strata of the hand, especially in their formation of important surgical spaces, have been inadequately or improperly described in textbooks and the anatomical literature up to the time of Kanavel.

Kanavel,[3] after multiple dissections and injections, described the deep fascial spaces — that is, the midpalmar and thenar spaces. He stated that these two spaces are separated in the palm by a fascial septum that arises from the undersurface of the flexor tendon of the middle finger and fuses with the fibrous tissue overlying the middle metacarpal bone.

Brickel,[20] in 1939, stated that in all his dissections and injections he never found a special palmar septum extending from beneath the flexor tendons to the middle metacarpal bone, dividing the palmar space in halves. Thus, he stated, it is justifiable to discard the concept of a midpalmar space in favor of a broader interpretation of its boundaries, and to discard the term "thenar space" in favor of the term "abductor space, anterior and posterior." I believe that Brickel's observations and conclusions are wrong.

Anson and Ashley,[21] in 1940, dissected many hands with special consideration of the fascial distribution. Their report, however, was inconclusive so far as the existence of the important surgical fascial spaces in the palm is concerned.

Because of the confusion concerning the existence of important surgical fascial spaces in the hand, I[22] dissected 100 hands with special consideration of the fascial distribution. In all the cases there was a definite septum of fascia coming from the undersurface of the flexor tendon of the middle finger, which was attached to the entire length of the middle metacarpal bone. This septum divided the palm into two main fascial spaces, and in no case was it possible to insert a probe beneath the flexor tendons in the proximal half of the palm and move it from side to side without meeting obstruction. Furthermore, in no case was a direct communication between the midpalmar and thenar spaces found.

Anatomical dissection of the fascia of these hands revealed that there are definite midpalmar and thenar spaces. The midpalmar space extends

from the middle metacarpal bone ulnaward to the radial side of the metacarpal bone of the little finger. Anteriorly, this space is bounded by the flexor tendons of the middle, ring and little fingers, the third and fourth lumbrical muscles and the thin fascia that connects these tendons and muscles.

The posterior boundary or floor is formed by the fascia covering the second and third volar interosseous muscles and the third, fourth and fifth metacarpal bones. In the distal third of the floor, small compartments are formed, since septums coming from the undersurface of the palmar aponeurosis are attached to the fascia of the volar interosseous muscles. These small compartments communicate with the midpalmar space. The medial boundary is the fascia on the radial side of the hypothenar muscles. The lateral boundary is the midpalmar septum, which extends from the undersurface of the flexor digitorum profundus tendon of the middle finger to the middle metacarpal bone. Distally, the midpalmar space extends to about 2 cm. proximally to the webs. The distal boundary is composed mainly of fascial septums extending from the palmar aponeurosis to the floor of the space and to some transverse fasciculi. The proximal boundary is a thin fascial septum usually found at about the level of the proximal end of the transverse carpal ligament. Clinically, however, abscesses do not usually enter the carpal tunnel. This fact is probaby due to tissue response to infections — that is, serous, cellular and fibrinous reactions.

The thenar space is bounded posteriorly by the adductor pollicis muscle. Medially, the boundary is the midpalmar septum, a thin fascia extending from beneath the flexor digitorum profundus tendon of the middle finger to the third metacarpal bone. Proximally, in all cases, this fascia, which is part of the adductor fascia, forms the boundary. This proximal boundary is found at about the level of the distal end of the transverse carpal ligament. The anterior boundary or roof is the thin layer of fascia formed as the midpalmar septum splits and courses laterally. In its lateral course this roof ensheaths the flexor tendons of the index finger to form part of the anterior boundary. The lateral boundary of the thenar space is formed by the thin fascia as it extends over the lateral edge of the adductor pollicis muscle and is attached to the dorsal aspect of this muscle. This distribution of fascia over the anterior, lateral and dorsal aspects of the adductor pollicis muscle clearly indicates why abscesses of the thenar space may extend to the posterior aspect of the muscle. The fact remains, however, that abscesses of the space tend to remain anterior to the adductor pollicis muscle.

Bunnell[23] stated that the midpalmar septum is so thin it is of questionable surgical value. In all my dissections there was an involvement of midpalmar and thenar spaces in only 2 cases, and this occurred after extensive local necrosis in which even osteomyelitis was found.

The symptomatology and differential signs of deep fascial-space abscesses are well known. In thenar-space abscess, there is tenderness over the palmar aspect of the thenar space. In midpalmar-space abscess, there is tenderness over the palmar aspect of the midpalmar space. Swelling is significant. In midpalmar-space abscess there is obliteration of the concavity of the palm and a slight bulge over it. In thenar-space abscess there is usually a rapid increase in size of the thenar area: the tissues seem to balloon out from the radial longitudinal crease of the palm. In both infections there is usually great swelling over the dorsum of the hand. The position of the fingers is of some diagnostic value. The middle and ring fingers are flexed when the midpalmar space is involved. The index finger is usually flexed when the thenar space is involved. The temperature for each infection ranges from 100 to 104°F. Midpalmar space abscess is relatively rare.

Other attempts at description of the symptomatology of the deep fascial-space infections have been made in the past few years. These descriptions have added nothing but confusion. It should be repeated, however, that a definite diagnosis must be made from history and physical examination before surgery is attempted.

Various incisions have been made in thenar-space abscess. Some earlier surgeons made a through-and-through opening from the palm to the dorsum. This incision is to be deprecated. It is followed by contractures, deformities and deranged function, and often new channels for infection are opened. Incisions over the volar aspect of the thenar eminence may cut across the proximal transverse crease and cause later contractures. Kanavel[3] was the first to show that adequate drainage can be obtained with an incision over the dorsum of the thumb-index web, and that a scar on the palm is thus avoided. Brickel[20] suggested an incision over the palmar edge of the first dorsal interosseous muscle. However, a large branch of the radial artery may be cut at the proximal end of the wound.

The incision for thenar-space abscess should drain pus, which may be found either volar to the abductor pollicis muscle or on both its volar and dorsal aspects. The incision of choice is made over the dorsum of the thumb-index web,

at the middle of a line drawn between the distal ends of the metacarpal bones of the thumb and index fingers, with the thumb in a position of abduction.

In midpalmar-space abscess various incisions have been used. Through-and-through incisions, employed by some surgeons even fifteen years ago, should be strongly condemned. If one remembers that the cellular tissue on the dorsum of the hand is loose, that edema of the dorsum is constantly found with infections involving the volar surface of the finger or palm, and that the lymphatics take the shortest route to the dorsum of the hand, a through-and-through incision will not be made. Spread of infection and contractures are certain to follow if an incision is made through the volar skin, midpalmar space, volar interosseous fascia, interosseous muscles, dorsal interosseous fascia, dorsal aponeurosis, subcutaneous tissue and dorsal skin.

Volar longitudinal incisions have been made, cutting across the proximal and distal transverse creases of the palm. These incisions are condemned because contractures follow.

Kanavel[3] first suggested that a vertical incision be made between the middle and ring fingers or between the ring and little fingers, with the idea that such incisions in addition to giving direct access to the midpalmar space would afford more adequate drainage of an involved lumbrical space and be associated with less risk of injury to the digital nerves and blood vessels.

Bunnell[23] first emphasized the danger of contracture resulting from vertical scars. Such contractures are found when the incisions completely divide the web or when the incision is carried too far proximally in the palm. Various types of transverse incisions have been described.

The incision of choice for midpalmar space abscess is a transverse incision through the distal transverse crease or on a line parallel with the distal transverse crease, or over the center of convexity of the palm. This incision is carried transversely through the skin, superficial fascia, and palmar aponeurosis. The digital vessels and nerves are identified and retracted with the flexor tendons. Usually a point between the flexor tendons of middle and ring fingers is entered. This latter incision is placed longitudinally through the thin subaponeurotic fascia between the flexor tendons, and enters the midpalmar space.

Sulfonamides, particularly sulfadiazine, are of value in decreasing the incidence and complications of deep fascial-space abscess.

Postoperatively, one must diligently adhere to elevation of the hand, splinting in a position of function, hospitalization with local and systemic rest, warm moist dressings under aseptic conditions, proper diet and adequate intake of fluid.

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CASE RECORDS OF THE MASSACHUSETTS GENERAL HOSPITAL

Weekly Clinicopathological Exercises

FOUNDED BY RICHARD C. CABOT

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CASE 29491

PRESENTATION OF CASE

A sixty-eight-year-old housewife entered the hospital because of chills and fever of forty years' duration.

About forty years before entry the patient began to have intermittent bouts of chills and fever. The chills were severe and shaking in character, lasted an hour and a half and were followed by fever and profuse sweating. They occurred two or three times a year and occasioned no alarm. No treatment was deemed necessary. She lived in New England at that time and had not been elsewhere. About eleven months before entry the chills increased in frequency, ranging between two times a week and once in ten days. The chills lasted up to an hour, were followed by fever of 104°F. and profuse sweats. The attacks were followed by prostration lasting for a day or two. During an attack the systolic blood pressure fluctuated between 210 and 110. Seven months before admission the patient went to Florida, where, during the course of one of the attacks, a physician found the blood "teeming with malarial parasites." She was given atabrine, sulfathiazole and barbital without relief. She returned to New England. The symptoms persisted and seemed to increase in severity. Her family physician was unable to find any parasites in the blood.

Six months before entry the patient was noted to have jaundice. The urine was dark, but the stools were normal in color. It is not stated how long the jaundice lasted or how severe it was, but it gradually cleared up. For the four weeks preceding admission, the chills and fever occurred at weekly intervals. There had been a weight loss of 50 pounds in the past year. Some nausea and vomiting of watery material were present occasionally after chills, as well as a mild pain across the upper abdomen. There was occasional dysuria, and some low back pain. The patient was said to have lived "on an inadequate bland diet because of ulcers diagnosed ten years before entry," but no additional information was available.

The patient had had a complete hysterectomy at thirty-seven for fibroids and a right radical mastectomy at fifty-four for carcinoma. Her father was said to have had a similar illness with severe shaking chills, aches and fever, which had been contracted in the South during the Civil War and was thought to be malaria. He died, however, from massive gastric hemorrhage.

Physical examination showed a well-developed and well-nourished woman lying quietly in bed. Numerous senile keratoses were seen below the breasts. The scars of the mastectomy and the hysterectomy were well healed. There was no superficial evidence of recurrence of the carcinoma. The pupils were round and equal and reacted to light and accommodation. The scleras were clear. There were tortuosity and narrowing of the fundal vessels, with arteriovenous nicking. The nasal septum was perforated, the hole being 0.5 cm. in diameter; the location of the perforation was not given. The lungs were clear. The heart was of normal size, the sounds were of good quality and regular. There were no palpable organs, masses or tenderness in the abdomen.

The blood pressure was 170 systolic, 70 diastolic. The temperature was 100.4°F., the pulse 88 and the respirations 20.

Examination of the blood showed a red-cell count of 4,360,000 with 12.8 gm. of hemoglobin. The white-cell count was 12,900 with 86 per cent neutrophils. A blood Hinton test was negative. The icteric index was 5. Repeated blood smears failed to show malarial parasites. The urine was light brown, with a specific gravity of 1.008 and a + test for albumin; the sediment showed occasional red cells, 8 white cells and 10 epithelial cells per high-power field. The culture was negative. The stools were light brown and guaiac negative. A stool culture was overgrown by a proteus bacillus.

X-ray examination of the chest showed the lung fields to be clear except for a small area of calcification in the region of the lower lung field. There was no evidence of metastatic cancer in the bones of the shoulder girdle. The diaphragm was smooth. The heart was not remarkable. An intravenous pyelogram was negative. Two Graham tests failed to show concentration of the dye in the gall bladder.

On the third hospital day an abdominal exploration was performed.

DIFFERENTIAL DIAGNOSIS

DR. CHESTER M. JONES: It has been a long time since I have read a case protocol that presents so

*On leave of absence.

many points of uncertainty. I am sure that I cannot make an absolute diagnosis. There are many discordant statements, which make a diagnosis difficult. One is the fact that the patient's physician found her blood "teeming with malarial parasites." This was not substantiated, but the examination was done in the South where such procedures should be adequately carried out. Secondly, the patient had a previous history of cancer of the breast. Thirdly, the nasal septum was perforated. Whether these facts have any bearing on the present situation is a question. I am inclined to think they do not. It is hard to forget all of them, however. The physical examination, except for evidence of arteriosclerosis and a perforated septum, was absolutely negative. Nothing was felt or found on auscultation or inspection that gave a clue concerning the existence of organic disease. The only evidence is the story of chills and fever, plus the fact that on two x-ray examinations the gall bladder failed to fill with dye. It is hard to correlate this paucity of facts with a story of about forty years of chills and fever.

What are the things that could give chills and fever of that duration? Obviously chronic infection has to be considered. One may properly ask the question whether these episodes of chills and fever that had occurred for thirty-nine years were the same things that were occurring during the eleven months before entry. There is no reason for saying that they are not, but that is a long duration of episodes that are preceded by rigor. In 1900, malaria was prevalent in and around Boston. I do not know where this patient lived, but if she lived around the Charles River Basin at that time she could have had it.

DR. BENJAMIN CASTLEMAN: She lived on the North Shore.

DR. JONES: I am not at all sure that there was malaria at that distance from Boston, but the story of malaria for forty years does not ring true. The Florida physician who found the parasites was not able to control the chills and fever with atabrine, a drug that should have a definite action on the parasites. There is every indication that adequate doses of atabrine should control the chills and fever of malaria. Whether or not sulfadiazine would have been effective is a question. She had chills and fever here, and malarial parasites were looked for, both in the hospital and outside, but none were found. It seems to me that even if she had had malaria in the past, this disease was not the condition that was productive of the recurrent chills and fever that brought this woman eventually into the hospital. I am not aware of any other parasitic manifestation that will cause recurrent chills and fever of this sort except amebiasis. It is conceivable that she might have had an amebic infestation followed by intrahepatic disease with abscess formation, which could have caused chills and fever for a long period of time. I do not know how far back a story of recurrent chills and fever on the basis of amebic abscess can go, but I know of one patient with an amebic abscess that caused symptoms twenty years after the original infestation. Here we have a story of chills and fever that began forty years ago and constantly recurred. It seems inconceivable to me that amebic abscess of the liver was the basis of the patient's difficulty. One fact that conceivably may help us here is that her father was in the Civil War and had something that caused diarrhea and chills, which also was thought to be malaria. Of course there was plenty of dysentery of the bacillary and amebic types in the Civil War. He might have been a carrier and contributed the source of the amebic infestation. I have no enthusiasm for that as a diagnosis in this case. The duration was too long, and after such a period it is surprising that there were no physical signs of liver involvement other than the fact that she was jaundiced on one occasion some months before she came into the hospital.

If it was not a parasitic infestation, was it a bacterial infection? What are the infections that persist for forty years and cause chills and fever? Osteomyelitis, undulant fever, tuberculosis and possibly endocarditis might cause chills and fever for a year prior to admission or perhaps a little longer, but hardly for forty years. We have no evidence clinically of tuberculosis, undulant fever or endocarditis. Chills and fever are sometimes due to an intermittent blockage of the ball-valve type of the ureter or renal pelvis causing hydronephrosis, or of the cystic or common duct. That does happen with ureteral stones, with a stone in the pelvis of the kidney and with gallstones, either in the cystic duct near the ampulla of the gall bladder or in the common duct. Of course as a rule these are associated with attacks of pain, but I can recall certain patients with chronic cholecystitis and stones who, from time to time, had recurrent episodes of chills and fever without any pain whatever. We know that this patient had these symptoms for a long time. We also know that her father, with whom she presumably lived, was very sick with chills and fever and diarrhea during the Civil War. I do not want to draw too much on that lead. On the other hand, typhoid fever was frequent; he might have been a typhoid carrier, and she might have had

a mild attack of typhoid fever, with residual infection in the gall bladder. These are conceivable probabilities but not at all clear, and certainly I have a great deal of difficulty in accepting any as a logical explanation of what brought this patient to the hospital.

In trying to reconstruct this case it seems to me that of the possibilities I have mentioned, a stone in the gall bladder that occasionally went down into the cystic duct and caused obstruction to the flow of bile from the gall bladder and infection, possibly with cholangitis, might answer the requirements for a diagnosis going back forty years. It is entirely possible that she could have had a real cholecystitis at twenty-eight years of age. I am inclined to suggest that as the only reasonable explanation of this history. It is backed up by the two x-ray films in which the gall bladder failed to fill. If the test was done properly, and no evidence of duodenal ulcer, intrahepatic disease or diarrhea was present, then such findings mean a nonfunctioning gall bladder.

As a remote cause of recurrent chills and fever, one might mention recurrent thrombophlebitis. I do not believe that the patient had it. Similarly, I do not believe that the patient had liver abscess. The perforation of the nasal septum could have been due to syphilis; but the evidence is against it. It may have followed a submucous resection, which was a frequent occurrence some years ago. I do not believe this patient had metastatic cancer. It could not explain forty years of chills and fever, nor could it explain eleven months of chills and fever in the absence of physical signs anywhere. Therefore I shall abide by a diagnosis of cholecystitis with stones in the common duct.

Clinical Diagnoses

Charcot's intermittent hepatic fever.
Cholecystitis.

Dr. Jones's Diagnoses

Chronic cholecystitis.
Cholelithiasis.

Anatomical Diagnoses

Chronic cholecystitis.
Cholelithiasis.
Choledocholithiasis.
Cholecyst-duodenal fistula.

Pathological Discussion

Dr. Castleman: Dr. Roger I. Lee saw this patient before operation and his note reads, "History and findings strongly suggest Charcot's intermittent hepatic fever." Dr. Arthur W. Allen operated on this patient and I shall read part of his operative note.

The liver was slightly darker than normal. The omentum was adherent to the under surface of the liver. It was freed with some difficulty by sharp dissection. As the operative site was further developed it became apparent that there was a cholecyst-duodenal fistula. The gall bladder itself was of normal size but its wall was markedly thickened. The fistula measured approximately 2 cm. across. Before division of the wall of the fistula it was thought wise to expose and explore the common duct. The ampulla and cystic ducts were developed, and finally the common duct was exposed. The latter measured 2.5 to 3 cm. across, and its wall was 2 mm. thick. The duct was opened, and there was an immediate gush of thick bile and numerous, black, friable, mushy stones. The distal centimeter of duct was packed with this sediment. A generous opening was made in the duct, and the sediment was removed with a scoop. The duct was finally irrigated with saline through a catheter.

After it had been ascertained that the obstruction was of a benign nature, the cholecyst-duodenal fistula was dissected. A finger could then be inserted into the duodenum, and the ampulla was accurately identified. The common duct was probed with this exposure, and the ampulla admitted a 3-mm. dilator snugly. Dilation was carried out through the 9-mm. dilator. The left and right hepatic ducts were calibrated, the right duct admitting a 7-mm. dilator.

The gall bladder was next removed from above down. The cystic duct was only slightly dilated. A No. 16 T tube was then sutured into the common duct, and a watertight closure was accomplished. Finally the duodenal defect was closed transversely, using two rows of catgut, reinforced with a third row of interrupted cotton.

This patient, therefore, had chronic gall-bladder disease for forty years, and each time one or more stones entered the fistula a block occurred that caused chills and fever; when the stones went through into the duodenum, she was relieved.

Dr. Jones: At one time there must have been a stone impacted in the cystic duct with empyema of the gall bladder, because the perforation into the duodenum must have occurred while the cystic duct was blocked.

Dr. Castleman: She remained in the hospital three weeks following the operation, free from fever and chills, and then went home.

Dr. Jones: Were the stones cultured?

Dr. Castleman: Yes, and the cultures showed only colon bacilli.

CASE 29492

Presentation of Case

First admission. A thirty-six-year-old American laborer was admitted complaining of pain in the chest.

About two years before entry, while lying in bed, the patient was suddenly seized with a severe pain in the left chest that radiated down the left

arm. The pain lasted about four hours and was very severe. At intervals thereafter he noted a vague sensation of pressure in the chest and moderate dyspnea on exertion. About two weeks before entry he had a severe attack of pain in the chest and left arm, which occurred during the night and lasted about an hour. The pain was less severe when he sat up, and was associated with a moderate amount of gaseous eructation. A sedative afforded relief and he was able to fall asleep. Shortly afterward he again awoke and voided a large amount of urine. On the following day he visited the Out Patient Department, where a general physical examination was said to be negative; the blood pressure was 135 systolic, 80 diastolic. A blood Hinton test was negative, and an x-ray film of the chest showed the lung fields to be clear. The heart was at the upper limit of normal in its transverse diameter and showed slight relative increase in the size of the left ventricle. The supracardiac shadow was normal, and the trachea was not displaced. An electrocardiogram was entirely negative. About a week before entry, in the afternoon while sitting at his work, the patient had another attack. This began as a sudden sensation of soreness in the left chest but was not severe enough to cause him to stop work. On his way home, however, he had a severe attack, during which he could do nothing but stand still for a minute or two. The pain at that time radiated down the left arm. He was compelled to take a taxi and on arriving home attempted to climb four flights of stairs, but was unable to do so. A physician administered some tablets that produced relief. The patient then tried to continue up the stairs but was compelled to stop frequently and finally succeeded in reaching his apartment after thirty-five minutes. He then lay down and went to sleep. The following morning he felt weak but was able to get up and go to work. During the succeeding week he had three minor attacks of chest pain and another very severe one, during which he entered the Emergency Ward. The last attack followed notification that his salary would be cut.

Examination showed a well-developed and well-nourished man lying flat in bed in no evident discomfort. There were no abnormal physical signs. The lungs were clear. The apex impulse of the heart was seen and felt in the fifth interspace in the midclavicular line. There were no murmurs.

The blood pressure was 120 systolic, 70 diastolic. The temperature, pulse and respirations were normal.

Examination of the urine was negative. The blood showed a red-cell count of 4,500,000, with a hemoglobin of 75 per cent. The white-cell count was 8800, with 71 per cent neutrophils. The stools were essentially negative. An electrocardiogram showed a PR interval of 0.16 second with normal rhythm; T_1 was low and slightly inverted, T_2, T_3 and T_4 were upright, and Q_4 was present. A Graham test and a gastrointestinal series were negative.

Six days later another electrocardiogram showed a late inversion of T_1; T_2 and T_3 were upright, with a slightly high origin. The patient's condition remained good through his hospital stay, and on bed rest he exhibited no discomfort. On the twentieth hospital day another electrocardiogram showed a slightly low T_1, which, however, was practically within normal limits; T_2, T_3 and T_4 were upright, T_4 was diphasic, and Q_4 was markedly shortened. He was discharged on the twenty-fourth hospital day.

Second admission (one and a half months later). The patient was followed in the Out Patient Department, where he complained of recurrent attacks of vague pain, always following mild exertion. The pain occurred in the left chest and frequently radiated down the left arm. An electrocardiogram taken two weeks after discharge showed a low T_1, an upright T_4 and an M-shaped QRS_4. One and a half months after discharge he was seized with substernal pain that was much severer than usual. It lasted for about an hour and was replaced by a dull constant ache in the chest and left arm. He went to sleep afterward and was suddenly awakened by a severe upper retrosternal squeezing pain even severer than the previous pain. There was an aching sensation in the left arm and jaw, and a splitting headache, and the patient was unable to lie back without aggravating the pain in his chest. He was placed in a taxi and immediately brought to the Emergency Ward.

Physical examination was again essentially negative. The heart was not enlarged but the sounds were distant in character.

The blood pressure was 110 systolic, 90 diastolic. The temperature was normal. The pulse and respirations were not recorded.

The blood showed a white-cell count of 10,000.

He continued to have substernal pain and vomited once after entry. Four hours later a few inconstant rales were heard at the bases of the lungs, but there was no change in his condition. The temperature remained normal. Although no significant change had been noted in his general condition, the patient suddenly died eight hours after entry.

Differential Diagnosis

Dr. Conger Williams: This case concerns a man of thirty-six with a history of recurrent at-

tacks of severe pain in the chest radiating down the left arm. He ultimately died, following one of the attacks two years after the onset of symptoms. In spite of the age of the patient the diagnosis of coronary heart disease with angina pectoris and myocardial infarction seems the best possibility. The pain was located in the left chest during the first few episodes but was later described as recurring in the substernal region. The pain of coronary insufficiency or myocardial infarction is usually located in the sternal region but may occur to the right or the left of it.

The negative findings on physical examination and electrocardiogram the day following the first attack do not exclude either myocardial infarction or coronary insufficiency. On admission to the hospital two weeks later, after recurrent episodes of pain in the chest and arm, the electrocardiogram was definitely abnormal, with an inverted T wave in Lead 1 and a Q wave in Lead 4. Six days later the T wave in Lead 1 was more deeply inverted. These electrocardiographic changes, especially the presence of a Q wave in Lead 4, are practically diagnostic of myocardial infarction, provided that the Q wave was of significant size. It would be helpful to see the electrocardiograms in this case, but they are not available. Apparent changes in the QRS complexes toward a more normal pattern during the first admission do not necessarily point against the diagnosis, since such changes may occur with minor differences in placing of the chest electrode at the apex. Furthermore, the T wave in the apical lead may be upright in an anterior infarction, with significant changes occurring either to the right or to the left of the apex.

I believe that at the time of the first hospital admission the patient had had several episodes of coronary insufficiency and probably at least one myocardial infarction. In the interval between admissions pain was present only on effort, further evidence in support of a diagnosis of coronary heart disease. The patient died eight hours after the onset of the final episode with symptoms suggesting myocardial infarction. His sudden death can therefore be explained by the onset of ventricular fibrillation.

Another possibility that must be considered is rupture of one of the coronary arteries, with death resulting from acute pericardial tamponade. Death does not necessarily occur immediately, but may follow in several hours, depending on the size of the break. The blood-pressure change, with the low systolic pressure and a narrow pulse pressure, is consistent with such a diagnosis, but no mention was made of dyspnea or distended neck veins, although the latter finding might have been missed after admission. Myocardial rupture must also be considered, but is most unusual only eight hours after the onset of an infarction.

There are several other possibilities, but I believe that coronary heart disease with recurrent myocardial infarction and angina pectoris is the only diagnosis that fits all the findings. Dissecting aneurysm of the aorta can produce pain of this type, but repeated episodes over a period of two years are hardly in keeping with the nature of the lesion, and the absence of hypertension is against it. Syphilitic aortitis with narrowing of the mouths of the coronary arteries may produce coronary insufficiency at an early age, but it is hardly in keeping with a history of prolonged episodes of pain suggesting infarction. Furthermore, the blood Hinton test was negative. The nature of the pain does not suggest saccular aneurysm of the aorta, and negative x-ray films dispose of this suggestion.

Other possibilities that might be considered briefly are mediastinal emphysema, pneumothorax and pulmonary embolism, but there is no evidence to support any of these diagnoses. Thus, I am left with only the diagnosis of coronary heart disease. Because of the patient's age one should raise the question of a systemic disease that produced involvement of the coronary arteries as one of its manifestations. Occasionally such a condition accounts for involvement of the coronary arteries in young people. Syphilis has already been considered and rejected. Xanthomatosis is a possibility, but no mention was made of splenic or hepatic enlargement, the blood cholesterol level was not studied, and no skin nodules were reported. Periarteritis nodosa and Buerger's disease are other conditions to be considered, but again there is no supporting evidence.

Clinical Diagnoses

Coronary thrombosis.
Coronary heart disease.

Dr. Williams's Diagnoses

Coronary heart disease with myocardial infarction (? anterior).
Ruptured coronary artery with pericardial tamponade?
Angina pectoris.

Anatomical Diagnoses

Coronary thrombosis, recent, right.
Coronary thrombosis, old, left descending and circumflex branches.
Myocardial infarction, old.
Myocardial fibrosis.
Arteriosclerosis, marked, coronary and aortic.
Hydrothorax, slight, bilateral.
Pulmonary edema.

Pathological Discussion

Dr. Benjamin Castleman: This patient did have severe coronary heart disease. Both main vessels were markedly atherosclerotic and calcified. There was an old thrombotic occlusion 3 cm. in length beginning a few millimeters beyond the origin of the left main coronary artery and another similar occlusion of the left circumflex branch near its origin. Most of the blood supplying the heart, therefore, must have been coming via the right coronary artery. This vessel was markedly narrowed in a few places but still patent except for one point about 4 cm. from its origin where there was a recent thrombus completely occluding the lumen. This was undoubtedly the cause of the last substernal attack that led to death. There was an old myocardial infarct involving the septum and anterior wall of the left ventricle, and scattered small foci of fibrosis in the rest of the heart, but no definite evidence of acute infarction. Eight hours is too short a period for one to be absolutely sure of changes in the myocardial fibers, and unless numerous sections were taken from various parts of the heart, a small area of acute infarction might be missed. The heart weighed only 325 gm. and was not hypertrophied. There was no hemopericardium.

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EPIDEMIC INFLUENZA

Each fall and winter following mobilization for this war there has been an increasing expectancy and uneasiness concerning the possibility of a recurrence of a pandemic of influenza similar to what occurred in 1918. This anxiety stems from the natural fear that such a pandemic might again take a tremendous toll of human life both in and out of the armed forces and that, in addition, it might so cripple temporarily both the battle and production fronts that it would necessitate alterations in the present schedules aimed at the successful termination of the war at the earliest possible date. Furthermore, all those concerned are only too well aware of the unhappy fact that although much has been learned about the etiology of influenza since 1918, little specific information has been acquired that offers hope of altering in any way the course of such an outbreak or even much hope of altering the outcome in individual cases.

During the past decade viruses have been recovered from circumscribed epidemics of influenza. The commonest of these is designated as influenza A, and another is called influenza B. A third and related virus has been isolated from swine during an epizoötic of influenza in this species. The characteristics of these viruses are now fairly well known. It is not known, however, whether these viruses are in any way related to the causative agent of the pandemic of influenza of 1918.

The last epidemic of influenza of any significant proportions occurred during the fall and winter of 1940-1941. At that time, influenza A was found to be the infecting virus in many parts of the United States, as well as in other countries.[1, 2] Similar outbreaks occurring in various parts of Canada have been studied since that time. Two of the latter have been identified as due to influenza A and one as probably due to influenza B.[3, 4] In one of the recent outbreaks of influenza A infection, vaccination with this virus was found to be totally ineffective as a prophylactic measure. All the outbreaks that have been studied since the new viruses were discovered have been relatively mild and have been associated with an extremely low mortality. In view of the fact that epidemics of influenza are prone to recur at two-year to three-year intervals, it is not unreasonable to expect an outbreak in this country during the present season.

A number of considerations lead one to believe that any epidemic in the near future is likely to be much less severe than was the pandemic of 1918. This, of course, is only speculation but is based on significant observations. In the first place, the influenza of the last war, at least in the Army camps from which complete reports are

available, was associated with a high mortality, but the deaths were accounted for chiefly by complicating pneumonias, in which the hemolytic streptococcus was the organism most frequently encountered. Other organisms, including the Pfeiffer bacillus and *Staphylococcus aureus*, were also involved. A similar high mortality accompanied the epidemics of measles that occurred in the same Army camps, and the mortality from this disease was also attributable chiefly, if not entirely, to the complicating hemolytic-streptococcus pneumonias.

During the 1940-1941 influenza outbreak, the staphylococcus played an important role in the complicating pneumonias, both in Boston and elsewhere.[1, 2] The results of intensive treatment of the complicating pneumonias with sulfadiazine and sulfathiazole were quite encouraging, and it was suggested that, should another outbreak of influenza occur, it might well prove useful to employ these sulfonamides in severe cases. This was particularly advocated in patients with severe prostration who had the signs or symptoms of tracheobronchial and pulmonary involvement, especially those in whom bacteriologic examination of the sputum had revealed the presence of hemolytic streptococci and staphylococci in appreciable numbers. In such cases, intensive treatment begun early and continued from three to five days might be expected to prevent an appreciable number of the fatal pulmonary complications. More prolonged therapy would be necessary, however, if the bacterial infection had already become established.

Another encouraging omen, which possibly has a more direct bearing, comes from the recent reports concerning measles. During the past year, outbreaks of this disease have occurred in the Army, but deaths from this cause have been rare.[5] The low mortality may be directly attributable to the widespread use of sulfonamide drugs in all cases having pulmonary complications, and it is not unreasonable to expect a similarly low fatality rate from influenza occurring under like circumstances.

From recent observations, particularly those made in the 1940-1941 epidemic, one may also expect that the staphylococcus will play a considerably greater role than in any of the previous epidemics. The increased frequency with which this organism is being encountered in complications of other respiratory diseases, as well as in surgical conditions, strengthens this possibility. The use of penicillin in staphylococcal pneumonias that occur as a complication of influenza would, of course, be most desirable; but the limited supply of this agent will probably preclude its employment on a large scale, at least during the coming season.

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BOOK REVIEWS

The question whether book reviews should be signed or initialed or should remain anonymous has been discussed many times at meetings of the editorial board of the *Journal* during the past several years. Owing to a letter published in the November 4 issue of the *Journal*, the matter has again been considered by the board, as well as by the Committee on Publications of the Massachusetts Medical Society.

It is obvious that a book review, to fulfill its function, must present to the reader the true opinion of the reviewer concerning the value of the book. If the latter is required to append his name or initials, he is likely to be less frank in his criticism of a book whose merit he questions, particularly if the author happens to be well known. On the other hand, anonymity permits unjust, possibly prejudiced, criticism, whereas the signed name

or initials often enable the reader to judge whether the reviewer is qualified to pass judgment on the book in question. That both sides of the question have supporters is evidenced by the fact that some medical periodicals have adopted one policy, whereas the remainder have selected the other.

During the many years that the *Journal* has been the official organ of the Massachusetts Medical Society the members of the editorial board have always been of the opinion that an anonymous review is likely to be more truly informative and useful than one that is signed or initialed. Furthermore, at recent meetings of the board and of the Committee on Publications, both bodies voted unanimously to continue this policy, with the added provision that the anonymity shall be absolute—in other words, that the name of the reviewer shall not be revealed on inquiry. This, of course, places considerable responsibility on the editorial staff, inasmuch as properly qualified reviewers must be selected and unjust criticism must be deleted. Such accountability, however, is nothing new and will continue to be accepted by the staff, with the earnest hope that it can be properly met.

MEDICAL EPONYM

Mendelian Law

The law that the type of one or other parent is predominant in hybrid progeny is one of the implications arising from the extensive experiments of the Austrian monk, Gregor Johann Mendel (1822–1884). A summary of Mendel's experiments was printed in the *Verhandlungen des Naturforschenden Vereines in Brünn* (4: 1865, 1866), under the title "Versuche über Pflanzen-Hybriden [Experiments in Plant Hybridization]." The extract translated below was taken from a reprint of the original article and appears in *Verhandlungen des Naturforschenden Vereines in Brüun* (49: 3–47, 1911); the following is found on page 24:

> An important clue is offered by the fact that in Pisum [the pea] constant forms appear among the progeny of hybrids in every combination of associated characters. So far as our experience goes, we find it universally true that constant progeny can be formed only if both the germ cells and the fertilized pollen are endowed with the capacity to produce identically similar individuals, as occurs in the normal fertilization of pure varieties. Therefore, we must also regard it as necessary that, in the production of constant forms by hybrid plants, completely similar factors must be working together. Inasmuch as the various constant forms are produced by *one* plant or even by *one* of its blossoms, the conclusion seems logical that there are formed in the ovaries of hybrids as many kinds of germ cells [germinal vesicles], and in their anthers as many kinds of pollen cells, as there are possible *constant* combination forms, and that these germ and pollen cells, in accordance with their essential nature, correspond to individual forms.
>
> In fact it can be shown theoretically that if we assume that the different kinds of germ and pollen cells are formed in the hybrids on the average in equal numbers, this hypothesis would be entirely adequate to explain the development of hybrids in single generations.

R. W. B.

MASSACHUSETTS MEDICAL SOCIETY

DEATHS

GAGE—James A. Gage, M.D., of Lowell, died November 29. He was in his eighty-sixth year.

Dr. Gage received his degree from Harvard Medical School in 1885. For many years, he was staff surgeon at the Lowell General Hospital until he retired from active practice in 1930. He was a member of the Massachusetts Medical Society and the American Medical Association.

His widow survives.

GIVAN—Lieutenant Commander James A. Givan (MC), U.S.N.R., formerly of Worcester, died November 14 at the United States Naval Hospital, Norfolk, Virginia. He was in his forty-fourth year.

Dr. Givan received his degree from Tufts College Medical School in 1922. He was appointed to the staff of the Worcester City Hospital in September, 1925, and rose to the post of assistant orthopedic surgeon. He had practiced orthopedic surgery in Worcester for over fifteen years when he entered the Navy in August, 1942. At the time of his death he was chief of the orthopedic staff at the hospital of the Naval Operations Base at Norfolk. He was a councilor of Tufts Medical Alumni Association and a past president of the Tufts Alumni of Worcester County. He was a member of the Massachusetts Medical Society, American Medical Association, Worcester District Medical Society and Boston Orthopedic Club and a fellow of the American College of Surgeons and American Academy of Orthopedic Surgeons.

His widow, his mother and four children survive.

POTHIER—Joseph C. Pothier, M.D., of New Bedford, died December 1. He was in his seventy-ninth year.

Dr. Pothier received his degree from McGill University faculty of Medicine, Montreal, in 1887. He was a member of the Massachusetts Medical Society and the American Medical Association.

His widow, a son, a brother and a sister survive.

SILBERG — MORRIS A. SILBERG, M.D., of Roxbury, died November 20. He was in his fiftieth year.

Dr. Silberg received his degree from Tufts College Medical School in 1920. He was a member of the Massachusetts Medical Society and the American Medical Association.

A daughter and a son survive.

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH

STATIONS FOR DISTRIBUTION OF ANTIPNEUMOCOCCUS SERUM

For the past twelve years, the Department of Public Health has maintained a statewide service for the provision of antiserums for pneumococcal infections. At the height of the demand for serum, in 1939, over nine hundred requests for serum were received. In the last few years the introduction of sulfonamide therapy for pneumonia has changed the situation so that the number of calls for serum has decreased over 90 per cent. Furthermore, the need for serum, when indicated, is no longer as urgent as it formerly was.

In the interests of efficiency and economy, therefore, the department has revised its schedule of depots for serum distribution, of which there were eighty-two at one time. Hereafter, serum furnished by the department will be available *only* at the following stations:

Types 1–33 inclusive:
Boston: Bacteriological Laboratory, State House

Types 1, 2, 4, 5, 7, 8, 9, 14 and 18:
Holyoke: Providence Hospital
Worcester: Worcester City Hospital

Types 1, 2, 5, 7 and 8:
Haverhill: Hale Hospital
New Bedford: St. Luke's Hospital
Pittsfield: House of Mercy Hospital

Type 1 only:
Ayer: Ayer Community Memorial Hospital
Beverly: Beverly Hospital
Boston: Antitoxin and Vaccine Laboratory
Brockton: Brockton Hospital
Framingham: Framingham–Union Hospital
Gardner: Henry Heywood Memorial Hospital
Greenfield: Franklin County Hospital
Great Barrington: Fairview Hospital
Hyannis: Cape Cod Hospital
Lowell: St. Joseph's Hospital
Malden: Malden Hospital
Nantucket: Nantucket Cottage Hospital
Newton: Newton Hospital
North Adams: North Adams Hospital
Plymouth: Jordan Hospital
Quincy: Quincy City Hospital
Walpole: Pondville State Hospital
Ware: Mary Lane Hospital

No changes are being made at this time in the facilities for pneumococcus typing or in the procedure for issuing serum. This procedure may be summed up as follows:

1. The pneumococcus must be typed in a laboratory approved for this diagnostic procedure by the Department of Public Health or in a federal laboratory.
2. The patient must be suffering from clinically diagnosed pneumococcal pneumonia, septicemia, endocarditis, meningitis or peritonitis.
3. In pneumonia, antiserums for Types 1, 2, 4, 5, 7, 8, 9, 14 and 18 are furnished for treatment on identification of the pneumococcus isolated from the sputum. Antiserums for the other types are supplied only when the blood culture is positive. (It is regretted that limited funds necessitate the continued application of the restrictive provision.)
4. In the other infections previously mentioned, antiserums for all types are furnished when pneumococcus is found in the blood, cerebrospinal fluid or peritoneal fluid.
5. In all circumstances, antiserum is furnished only with the understanding that any unused serum will be properly refrigerated until the patient is discharged and then will be returned promptly to the Antitoxin and Vaccine Laboratory, 375 South Street, Jamaica Plain, Massachusetts, and that when the patient is discharged, a case history on the form provided will be filled out and sent to the Antitoxin and Vaccine Laboratory.

MISCELLANY

DANGER FROM FLUOROSCOPY

Much used by both internist and surgeon in other fields of medicine, the fluoroscope has proved a valuable aid in the diagnosis of pulmonary lesions and in the periodic recheck of their progress. A competent examiner, using good equipment, is often able to secure information that may not be ascertainable by means of conventional films, such as the movements of the diaphragm, the contrasting appearance of the expanded or contracted lung, and the effect of moving the thorax into different positions before the screen. Warnings that this method should supplement, not replace, good roentgenograms have been frequent. A recent editorial (Stenstrom, K. W. Danger from fluoroscopy. *Minnesota Med.* **26**:558, 1943) contains a timely warning of another danger — one inherent in the physical properties of the electric current and of the roentgen ray. This safety-first appeal merits serious thought.

A number of articles have been published concerning the dangers connected with fluoroscopy. Recent measurements have shown that these warnings must be taken seriously and that they concern the whole medical profession. The problem is more acute now when the serious film shortage may call for more extensive use of the fluoroscopic method, and it seems advisable to call attention to a few pertinent facts.

No fluoroscopic unit should be used unless the doctor in charge has convinced himself that the conditions under which it is operated are reasonably safe. A continuous vigilance is necessary, and it is not enough to know that the conditions were satisfactory at one time in the past.

A shock-proofed arrangement should remove electrical dangers but a broken cable or a casual repair may

lead to electrical hazards, and many of the old machines have exposed high-voltage leads. Grounding a part of the apparatus may not always serve as protection, and if the ground is applied at the wrong place the danger may be increased. A careful expert inspection is needed and there can be no valid excuse for an accidental electrocution. Such accidents have occurred a number of times.

Roentgen rays from fluoroscopic units have caused innumerable sequelae to both patients and physicians, and serious damages often still result in spite of the knowledge that now is available.

In order to obtain adequate protection, it is first required that the tube be shielded so that no radiation of any consequence escapes in any direction except in the useful beam. This may be checked roughly with a hand fluoroscope or more accurately with a roentgen meter with a sensitivity of 0.01 r or a Geiger–Muller counter. After this first requirement has been fulfilled several other precautions must be taken.

For any intelligent use of fluoroscopy, it is important to know the amount of roentgen rays reaching the skin of the patient and of the examiner, and that has to be determined by means of measurements. The total dose received depends on the intensity and the time of exposure. The intensity depends on a number of factors and varies widely in practice. A reasonable intensity at the skin of the patient nearest to the tube amounts to about 20 r per minute.

A representative of the Division of Biophysics, University Hospitals, has recently checked some machines in Minnesota, and has found intensities during routine practice up to 114 r per minute. It is evident that such an intensity is dangerous and must be reduced by proper adjustments. The question is how many of the machines which have never been calibrated are used under similar conditions with an unnecessarily high intensity.

The intensity may be reduced by increasing the distance from the target to the patient. This distance should be at least 28 to 30 cm. It can also be reduced by lowering the current, which should not exceed 4 to 5 ma. If the fluorescence is not bright enough the voltage may be raised and it is advisable to use rather high voltage, preferably 80 kv. or 100 kv. if possible with the equipment. With a high voltage a filter helps to lower the intensity considerably and a 1-mm. aluminum filter should be permanently attached.

With the use of a target skin distance of 28 cm., 90 kv., 4 ma., and a 1-mm. aluminum filter, the intensity can undoubtedly be kept within the safe range, but it is still advisable to have it measured so that the number of roentgens applied per minute will be known.

The time used for an examination should be kept at a minimum. It should be measured and recorded. A foot switch should be used so that the current applied to the tube may be limited to the time of inspection. The use of a timer, which sums up the exposure and shuts off the machine when the dose decided on has been given, is advisable.

Some fluoroscopic examinations require an exposure of 5 minutes. With an intensity of 20 r at the patient's skin, this means a dose of 100 r. A dose of 75 r is often used for the treatment of skin diseases, and the title of an article in the *Journal of Radiology*, "Roentgen Therapy in Fluoroscopy," is therefore no exaggeration.

The rules laid down here for the safety of the patient may seem drastic. They are, however, not difficult to follow after they once have been accepted, and certainly patients have the right to expect the physician to take the necessary precautions in order to avoid serious injury from a simple examination. These rules also help to protect the examiner, though any injury to him is due to accumulation of exposure over a long time rather than to a single dose. He must be particularly careful to protect the hands, which are inevitably exposed at palpation during the fluoroscopic examination. The use of lead-rubber gloves may help, but not unless the gloves are heavy and designed to shield the whole hand can they be relied on to give complete protection. Light gloves may give a false sense of security. The examiner must in any case be aware of the danger and take all possible precautions.

The most dangerous procedure, and the one that has caused most of the injuries, is the setting of fractures under fluoroscopic visualization. This practice must be condemned and the radiologist in charge should enforce the rule that nobody on the staff be permitted to use the apparatus in this manner. The doctor may receive enough exposure from the setting of a single fracture to produce a severe skin reaction. It is, of course, good practice to inspect the position fluoroscopically and that can be done several times without exceeding the permissible total dose.

A number of physicians already have suffered the consequences of too much exposure during fluoroscopy. They have been severely handicapped, and some have paid with their lives. The tragedy has been extremely impressive, and it is hoped that others will heed the warnings before it is too late. — Reprinted from *Tuberculosis Abstracts* (November, 1943).

REPORT OF MEETING

TRI-DISTRICT MEETING

A joint meeting of the Middlesex East, North and South district medical societies was held on November 10, 1943, at the Boston Medical Library. The presiding officers were the presidents of the district societies, — Dr. Roger M. Burgoyne, Dr. Herbert M. Larrabee, and Dr. Harold G. Giddings, — and the last acted as chairman.

The meeting was called to order at 8:15 p.m. The chairman stated that on the receipt of a telegram from Washington less than a week before, arrangements were promptly made in order to extend the utmost co-operation to the Procurement and Assignment Service, to the medical departments of the Army, Navy and Public Health Service and to Selective Service, which groups had asked that such a meeting be called in the shortest possible time. Dr. Giddings thought that few district medical society meetings had been arranged so quickly, which indicated the willingness of the profession to assist in solving the medical problems of the armed forces. The assembly was then addressed by various persons representing the State and the Government.

Dr. Reginald Fitz, chairman of the Massachusetts Committee of Procurement and Assignment, stated that in 1942 there were approximately 8000 physicians of all ages, including interns and residents, who were practicing in this state and that of this number about 2000 are now in the service.

Dr. Frank Lahey, chairman of the Directing Board of the Procurement and Assignment Service, spoke about the recruitment program. He stated that every man marked "available" is now needed by the military forces.

He thought that any physician was privileged to question any other physician concerning how he had been rated. He stated: "If a man has been marked 'essential,' he can be conscience clear since he has had nothing to do with such a rating. If one so marked wishes to join the service, he must find a substitute, and he may request the Procurement and Assignment Committees to assist him." Dr. Lahey then spoke about the men who had been marked "available." He said, "If such a person does not agree with his rating, he should appeal his classification to the state chairman." He emphasized the fact that a physician who has been marked "available" and has not sought an appeal, indicates by his action that he is disinterested and therefore is truly available for military service. Dr. Lahey then read a copy of a personal letter that he had sent to physicians informing them of the great need and asking them to file their papers for a commission. He further stated that there were about 10,000 physicians in the Navy and about 40,000 in the Army, but that the armed forces still needed every "available" physician who could pass his physical examination.

Lieutenant Colonel Durward Hall, representing the Office of the Surgeon General, spoke about the Army needs. He, like the officers who followed him, brought greetings from the various offices of the Surgeon General. He stated that the Army needed 48,000 medical officers by the end of 1943 and that during 1943 about 1000 physicians had been released from the service. He spoke forcibly of this need and urged that all "available" physicians come before the currently organized committee, of which he was a member, and present their problems so that appropriate advice could be given.

Commander Francis J. Braceland, from the Bureau of Medicine and Surgery, then spoke about and stressed the Navy needs. He said that the Navy was short about 6000 medical officers, that it would welcome specialists and that physicians, even above the draft age, would be accepted.

The needs of the United States Public Health Service were then discussed by Dr. John Trautman. A history of the Public Health Service was presented, as well as facts pertaining to the increased war services of this branch.

A question period was then conducted by Dr. Paul Barton, assistant executive officer of the Washington office of the Procurement and Assignment Service. Some of the questions and answers are as follows:

Q. What are the present age limits for service in the medical corps of the armed forces?

A. The upper limit in the Army is, in general, the forty-fifth birthday, but for specific position vacancies men up to sixty are eligible. The limit in the Navy is, in general, the fiftieth birthday.

Q. What is the present status of physical requirements?

A. The Navy at the present time still has the highest standards, although they are lower than they were. The Army is next, and those who are physically disqualified for Army service may be eligible for commission in the United States Public Health Service.

Q. What ranks are being offered by the services at the present time?

A. The Army is limiting those under thirty-eight to first lieutenancies and those about thirty-eight to captaincies and above if they meet the special requirements of the Surgeon General. The higher ranks depend on special qualifications. The Navy is limiting those thirty-four and under to lieutenancies, junior grade, those from thirty-four to thirty-eight to lieutenancies, and those from thirty-eight to forty-four to lieutenant commanderships. For specific position vacancies requiring special qualifications higher commissions may be offered. The Public Health Service has commissioned ranks similar to those in the Army.

Q. What are the present needs of the services?

A. All three branches of the armed forces are in immediate dire need of several thousand additional medical officers. This immediate period of need is between now and January 1.

Q. Why is the Public Health Service classed as one of the branches of the armed forces so far as medical officers are concerned?

A. For many reasons, among them the fact that they supply the medical personnel for the United States Coast Guard. Physically qualified eligible officers are assigned by the Public Health Service for active duty with the Coast Guard and may be assigned anywhere the American flag flies.

Q. Why have so many practitioners who are capable of serving long hours in civilian practice been disqualified for military service?

A. The exigencies of service in combat areas are such that civilian practice is no criterion of physical qualification. The services at the present time have a full quota of those whom they can accept for limited duty. They are being forced to discharge some at present. Certain individual physicians who still will be able to undertake heavy civilian duties are no longer able to cope with the needs of combat troops.

Q. Why is it necessary for a physician to take an indoctrination course after becoming a medical officer?

A. The reason for this is that a physician becomes a medical officer, which means that he is at all times an officer subject to the duties of officers in other branches of the service. He must be responsible for those under his command and must be entirely capable of meeting any situation that confronts such personnel as is under his direct supervision whether it be in open field duty requiring the setting up of field hospitals or the maintenance of food supply and shelter for his personnel, as well as a correlation of the activities of his group with the other services under the same command.

Q. Is it true that the armed forces are not making efficient use of their medical personnel?

A. There have been many occasions in the past when appearances would lead one to believe that they were not. At the present time efficient use is being made of such personnel, and it must always be remembered in this connection that a reserve supply of such personnel must be maintained for immediate assignment to duty. Such a group must have been trained together to meet the situations that it will face immediately after assignment and cannot be gathered together at the last minute to be assigned to some specific post.

Furthermore, the planning of any military campaign requires a complete line-up of all services. If reverses are suffered such men who are held in preparation of projected positions may not be able to fill such positions and must be held for further plans. War, by its very nature, is not essentially efficient, but the lack of medical personnel in the various branches of the armed forces has resulted in a high increase in their efficient use.

Q. On the basis of present ratios of physicians to total personnel, which service has the greatest need at the present time?

A. The Army ratio is slightly over 5 per 1000, whereas the Navy is somewhat under 4 per 1000. Therefore, the Navy needs men somewhat more than the Army.

Q. Why is any man under thirty-eight ever classified as essential?

A. He is only essential if he were to leave his community or his institution and there were no replacement for him. No man under thirty-eight is, as a general rule, considered permanently essential, but only essential until he can be replaced by another physician who is not eligible for service with the armed forces.

Q. Has not the civilian population been endangered by the number of physicians who have entered the armed forces?

A. Not for the Nation at large. There are various problems of redistribution that have been partially or completely solved and some that will be difficult to solve, but if such distribution is equitable there is no shortage at present for minimal adequate civilian care.

Q. Will not the needs of the services continue and require that additional personnel leave civilian life?

A. To some extent, this is true, but primarily the services will be able to meet their own needs for replacement from the students they are training at present. The Navy may need some additional personnel even though they are also training students. The Public Health Service will continue to have needs since they do not have any students in training.

Q. Why do not the armed forces adopt the liberalization of qualifications that exist in England and elsewhere?

A. Because it is essential that American standards be maintained for the men in the armed forces as well as on the home front. Comparisons with the armed forces of other nations are not in order any more than comparisons of physician-population ratios on the home front are with those of other nations. The mortality in the armed forces at the present time is astoundingly low and every effort will be made to keep it at that level. This will obviously require further sacrifices on the part of those on the home front, but the Procurement and Assignment Service is constantly aware of the fact that supplies of all kinds must continue to flow to those who are on active duty and that the health of the home front is therefore as much a part of the war effort as is the health of the soldier.

Q. What action does Selective Service take on physicians?

A. Although local boards differ somewhat in their actions, in general, no action is taken at present on physicians or others over thirty-eight. Reclassification of those under thirty-eight is going on constantly and dependency is not considered to the same extent as it was in the past.

Dr. Barton, before the close of the meeting, again stated that the reviewing committee of which he was a member would meet for about ten consecutive days at the Boston Medical Library and was anxious to help all physicians seeking enlistment.

BOOK REVIEW

Diagnosis of Uterine Cancer by the Vaginal Smear. By George N. Papanicolaou, M.D., Ph.D., and Herbert F. Traut, M.D. 4°, cloth, 46 pp., with 11 color plates. New York: The Commonwealth Fund, 1943. $5.00.

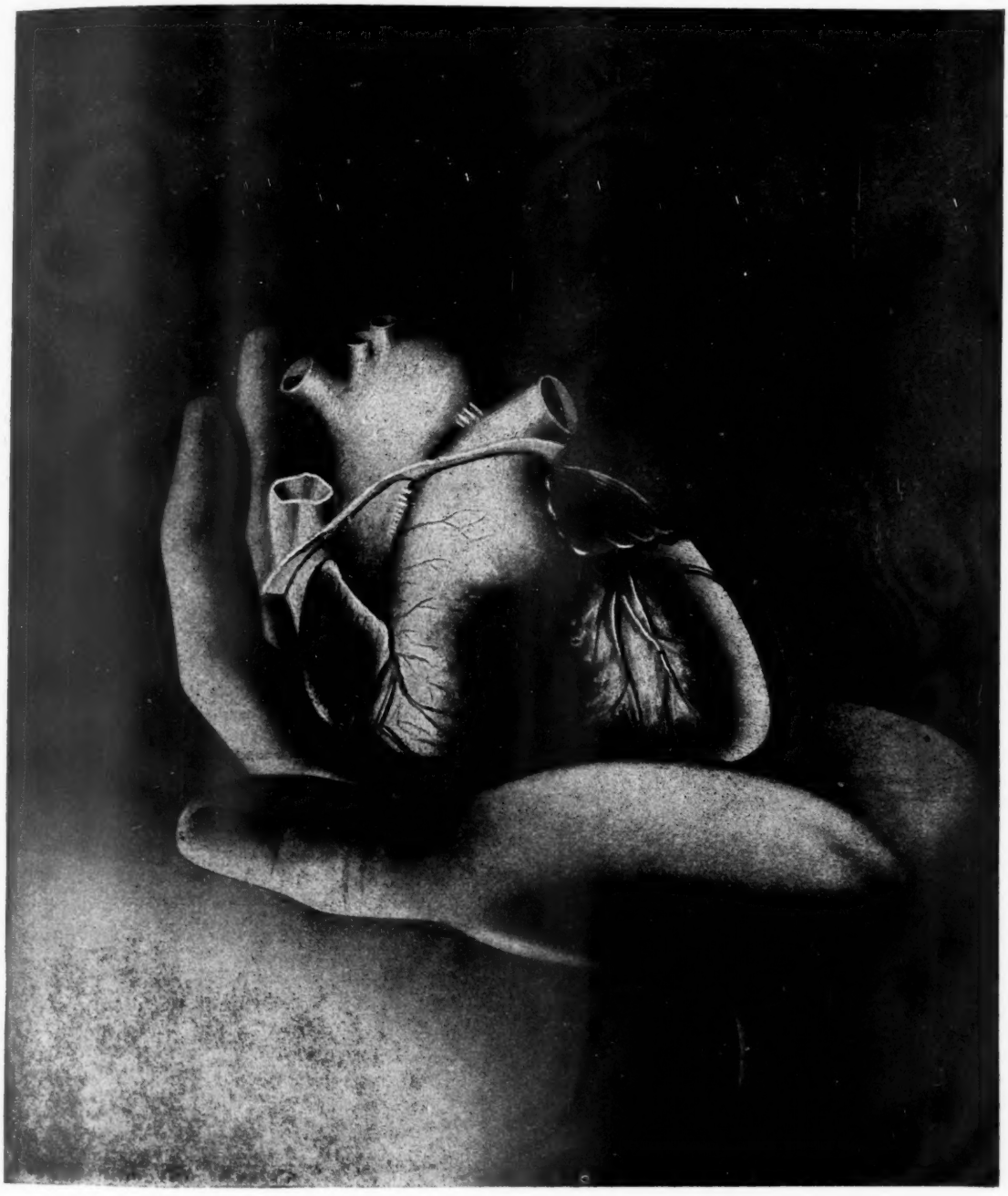
In this well-written and beautifully illustrated atlas, the authors have elaborated another method of making the diagnosis of early carcinoma of the uterus and lower genital tract. Virchow believed that the only absolute means of knowing whether a tissue was malignant was by demonstrating its invasion of other surrounding structures. This view was accepted until recent times, when the diagnosis of cancer in its preinvasive stage was accepted. The study of the cells desquamated from the superficial layers of the malignant neoplasms of the uterus and found in the vaginal secretions, makes, in the hands of those so trained, such a diagnosis possible — that is, the recognition of cancer in areas removed from its origin.

The preparation of the vaginal smear and its staining are taken up in the first chapter, whereas the general classification of the epithelial cells of the vagina and cervix found in the vaginal fluid makes up the subject matter of the second chapter. Six pages are devoted to the cellular contents of the vaginal fluid at different periods of the normal sex cycle, and an equal number of pages to the effect of modified physiologic and of pathologic conditions of the cellular elements of the vaginal fluid. The characteristics of vaginal smears in cancer of the cervix, adenoma malignum of the cervix and adenocarcinoma of the cervix are freely discussed. The characteristics of vaginal smears in cancer of the uterine fundus, adenoma malignum of the uterine fundus and adenoacanthoma of the uterine fundus form the subject matter of an entire chapter. The narrative part of the book is closed by a discussion of the use of the vaginal smear as a diagnostic procedure.

There follow eleven plates showing the various types of cells found in the smears under physiologic and pathologic conditions, with clear and understandable legends. The preparation of these plates must have involved a tremendous amount of painstaking work. The authors offer this method, which, in their hands, has proved to be helpful in the diagnosis of early cancer of the uterus, but they do not advocate it at the exclusion of all others that have given satisfactory results.

The student of uterine cancer, whether working in the laboratory or in the operating room, will find this book a distinct addition to his library.

(Notices on page x)



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NOTICES

DIRECTORY OF MEDICAL SPECIALISTS

The *Directory of Medical Specialists* will, in the future, be published by the A. N. Marquis Company, Chicago, publishers of *Who's Who in America*. Previous editions have been published for the Advisory Board for Medical Specialties by the Columbia University Press, New York City.

It is planned not to issue the next edition before 1945 on account of the war, but the A. N. Marquis Company will publish a supplemental list of all those who have been certified by the American boards since the last (1942) edition of the directory, totaling about 3600. This is to be distributed at cost, and monthly or bimonthly bulletins listing successful candidates for certification at examinations during the additional interim before the next edition are to be issued as a subscribers' service.

Dr. Paul Titus (Pittsburgh) of the American Board of Obstetrics and Gynecology continues as the directing editor, and Dr. J. Stewart Rodman (Philadelphia) of the American Board of Surgery continues as associate editor. The Editorial Board will be composed, as before, of the secretaries of the fifteen American boards.

Communications should be addressed to the Directing Editor, *Directory of Medical Specialists*, 919 North Michigan Avenue, Chicago 11, Illinois.

NEW ENGLAND SOCIETY OF PHYSICAL MEDICINE

The regular meeting of the New England Society of Physical Medicine will be held at the Hotel Kenmore on Wednesday, December 15, at 8 p.m. Dr. Howard Moore will speak on the topic, "Observations Regarding Common Foot Conditions: Their prevention and treatment," illustrating the talk with motion pictures.

Preceding the meeting, there will be an informal dinner in the Empire Room. This follows the council meeting at 6 p.m.

NEW ENGLAND ROENTGEN RAY SOCIETY

The next meeting of the New England Roentgen Ray Society will be held in the library of the Harvard Club on Friday, December 17. Drs. M. C. Sosman and Albert Ferguson will conduct an x-ray conference on diseases and tumors of bone from 4:30 to 6:00 p.m. At 8:00 p.m., Dr. Albert Oppenheimer, of Laconia, N. H., will speak on the topic, "An Analysis of Roentgen Findings in Vertebral Disease."

SOUTH END MEDICAL CLUB

A regular meeting of the South End Medical Club will be held at the headquarters of the Boston Tuberculosis Association, 554 Columbus Avenue, Boston, on Tuesday, December 21, at twelve noon. Dr. Robert W. Buck will speak on the topic, "The Significance of Mild Hypertension."

Physicians are cordially invited to attend.

ALLERTON HOSPITAL

The regular monthly meeting of the Medical Staff of the Allerton Hospital will be held at the hospital on Thursday, December 16, at 8:30 p.m. Dr. I. R. Jankelson will speak on the subject, "Chronic Gastritis." A discussion by Dr. Charles W. McClure will follow.

Physicians and medical students are cordially invited.

(Continued on page xiii)

SOCIETY MEETINGS AND CONFERENCES

Calendar of Boston District for the Week Beginning Thursday, December 16

Thursday, December 16
*9:00-10:00 a.m. Medical clinic. Dr. S. J. Thannhauser. Joseph H. Pratt Diagnostic Hospital.
5:00 p.m. The Constitutional Factor in Skeletal Form. Dr. LeRoy Johnson. Children's Hospital, Boston.

Friday, December 17
*9:00-10:00 a.m. Certain Atypical Forms of Rheumatoid Arthritis. Dr. Marian Ropes. Joseph H. Pratt Diagnostic Hospital.
4:00-8:00 p.m. New England Roentgen Ray Society. Harvard Club, Boston.

Saturday, December 18
*10:00-11:30 a.m. Medical staff rounds. Peter Bent Brigham Hospital.

Monday, December 20
*12:15-1:15 p.m. Clinicopathological conference. Peter Bent Brigham Hospital.

Tuesday, December 21
12:00 m. Significance of Mild Hypertension. Dr. Robert W. Buck. South End Medical Club. Headquarters of the Boston Tuberculosis Association, 554 Columbus Avenue, Boston.
*12:15-1:15 p.m. Clinicoroentgenological conference. Peter Bent Brigham Hospital.
2:00-4:00 p.m. Myasthenia gravis clinic. Out Patient Department, Massachusetts General Hospital.

Wednesday, December 22
*12:00 m. Clinicopathological conference. Children's Hospital.

*Open to the medical profession.

December 15. Boston Society of Biologists. Page xiv, issue of December 2.
December 15. New England Society of Physical Medicine. Page x.
December 16. Allerton Hospital. Monthly meeting of medical staff. Page x.
January 13. Sudden Death. Dr. Alan R. Moritz. Pentucket Association of Physicians. 8:30 p.m. Haverhill.
February 12. American Board of Obstetrics and Gynecology. Page ix, issue of October 28.
May 23 and 24. Massachusetts Medical Society. Annual meeting, Hotel Statler, Boston.
June 12-16. American Medical Association. Annual meeting, Chicago. Page 798, issue of November 18.

District Medical Society

WORCESTER
January 12. Memorial Hospital, Worcester.
February 9. Worcester State Hospital, Worcester.
March 8. St. Vincent Hospital, Worcester.
April 12. Hahnemann Hospital; Worcester.
May 10. Annual meeting.

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